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RESTAURANT ORDERING AND RESERVATION SYSTEM

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Abstract

In order to compete the more demanding business world, the project, Restaurant Ordering And Reservation System is aimed to provide a cost-effective solution for both the restaurant customer and the restaurateur/wait staff at a time to provide customer a quality service in a friendly and timely manner.

The author had chosen the waterfall model as the development approach. During the development cycle, few techniques to gather information will be applied, namely, documentary research, Internet surfing, questionnaire and interview.

The Restaurant Ordering And Reservation System will be developed using Windows 2000 Server, Palm OS 4.0, Parity Software, AppForge, and utilizing Microsoft SQL 7.0 databases through.

This system will be divided into three parts, which are Wireless Handheld Order Taking subsystem, IVR Reservation subsystem and Backend Monitoring subsystem. An application will be built on a handheld equipped with Palm OS, where wait staff can simply take order by touching the screen using stylus pen and the order is then directly send to the kitchen, bar and counter via infrared wireless communication technology. IVR Reservation allows customer make a reservation at any time by phone call. They can use their touch-tone pad to input requests and database will speak information back to the caller. Backend Monitoring is a database that capability to store the customer order taken by the wait staff and the reservation information.

Since in this country still does not have a company that provides wireless order taking and IVR reservation solutions, so it is possible that the local market need this technology. It is believed that the Restaurant Ordering And Reservation System will be beneficial to either the customer or the restaurant owner.

Acknowledgments

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1.1 Project Overview

Restaurant dining is a means for social interaction, relaxation, and nourishment. Besides providing a pleasant environment and good food, restaurants must make it easy for customers to order items that they will like in order to maximize the enjoyment of the dining experience. It is common knowledge among professional restaurateurs that customers are far more likely to complain about the service than the food. However, most of the restaurateurs in Malaysia are always thought that making good food is already enough and hardly concern about the customer service.

There is an obvious phenomenon that we can see in nearly every restaurant in Malaysia, where wait staffs usually have to move around between the customers, the kitchen, the bar and the counter. [Enterprise Case Studies, 2001] This is particularly ineffective and inefficient when it is busy in the restaurant. The reason behind is none of the existing ordering systems or ordering methods that are commonly use by the restaurant can affectively eliminates the job of the wait staff.

In the mean time, customers also face with the problem where they couldn't find a table when they reach the restaurant, especially that kind of famous and popular restaurant. The arising of the problem is because there is no existing restaurant reservation system that could provide a good solution for the problem. Even some of the restaurants in Malaysia have provided phone call reservation or booking service, but customers also facing with the situation like no one pick up the call after holding for a long period.

In order to compete the more demanding business world, the project, Restaurant Ordering And Reservation System is aimed to provide a cost-effective solution for both the restaurant customer and the restaurateur/wait staff. The primary concern of the customer is to receive quality service in a friendly and timely manner. Their satisfaction is dependent on the quality of service and atmosphere, as well as the food. Meanwhile, restaurant wait staff and management are ideally concerned with providing adequate and fair service to all of their customers in order to earn an income. They are expected to be knowledgeable of the main facets of the restaurant. They will also be expected to become

expert users of any systems introduced into the work place. There satisfaction with any new system will be dependent on its ability to assist them in their jobs without introducing new tasks of greater difficulty or hassle.

1.2 Project Definition

Restaurant Ordering And Reservation System is a system that provides solutions for the three main players of the food service industry, which are restaurateur, wait staff and customer. Basically the system will be divided into three parts, which are Wireless Handheld Order Taking subsystem, IVR (Interactive Voice Response) Reservation subsystem and Backend Monitoring subsystem.

Wireless Handheld Order Taking subsystem is a direct replacement for the pad and pencil that waiters carry around today, and is targeted for small or medium-size, busy, sit-down restaurants. Every wait staff will be given a Palm OS equipped handheld to take order by using stylus pencil, and signal from every handheld will be received by a computer system via infrared, where the order is then send to the kitchen, bar and counter within a local area network. The order list will be displayed on a screen in the kitchen to notify the kitchen staff. This system provide restaurants staff with a revolutionary new way to exchange information, which increases efficiency and profitability.

On the other hand, Restaurant Ordering And Reservation System has another main feature, where customers can make a reservation by a phone call with the IVR Reservation subsystem. The application works in such a way similar with any others IVR applications in the market such as help desk IVR system. [Commonly Used Applications, 2000] Callers can use their touch-tone pad to input requests, in this case is reserving a table. Database then speaks information back to the. Customers will be asked to key in their contact number and a reference number will be given to them for successful reservation. Customers could conduct transactions 24 hours a day, seven days a week. Another benefit is customers no longer have to queue up and wait for a table.

Backend Monitoring subsystem will be the part that monitor and control the other two subsystem of the Restaurant Ordering And Reservation System. This is where the main server resides that stores the needed data. Restaurateur or any authorized person

could login to the system and perform some tasks such as checking the currently order status for each table and reservation record. All meals that coming out from the kitchen will be checked and recorded down by the staff at the counter side into the system, which will then be sent to the customer by a runner.

1.3 Problem Definition

Currently there are no existing systems that provide efficient solution for restaurant wait staff and customer in Kuala Lumpur area based on the research that has been carried out. Although there are many existing system such as touch screen ordering or wireless ordering system that is very popular being used by restaurateurs of other countries, such as US, England and Japan, however these new technologies are not widely used in Malaysia. Based on the result of the survey, only a few of the standard hotel and big restaurant are using the latest and efficient ordering system. Most of the small and medium-sized restaurant owner are still remain faithful with the traditional pen and pad/carbonized pad ordering method even they found that it is not efficient enough. Bottom copy of an order would be taken to the kitchen. Whilst the top would be kept at the bar to be manually priced and calculated, presenting it to the customers for payment.

Most of the restaurateurs complain that cost to purchase touch screen system or wireless handheld ordering system is too high compare relatively to their daily sales and restaurant capacity. In addition, currently none of the local companies are selling the wireless handheld ordering product. It is only a developing product of a local company based on the research that has been carried out. Lack of exposure to the new technology and the high cost to purchase the system become the main reason that scared away the restaurateurs.

By using the traditional ordering method, wait staff are totally bounded with the manual task of writing, delivering, pricing, calculating and recalculating bills, which they couldn't concentrate on looking after customers and providing a prompt and efficient service. Below is the list of the problems that arise.

a) **Duplicate orders**

Writing down orders and then having to re-enter them at a fixed computer terminal or cash register is needed. This duplicates orders between the tables and the fixed POS terminal or cash register.

b) **Wasting Time**

The need of the wait staff to move from table, to the kitchen, bar and counter and back again. Repeating of walking done by the wait staff can be tedious especially when the restaurant is busy.

c) **Human error**

Normally many meals were thrown away per day because an order was written down or read incorrectly by the wait staff and the kitchen staff. Mixing up tables and/or people.

d) **Customers lose sight of the wait staff**

Wait staff do not have more time to interact with the customers at the table since they need to concern about sending the order to the kitchen and counter. Thus this will introduce the poor service image of the restaurant.

On the other hand, we always found that in the popular and busy restaurant, customers have to queue long or are given a number to wait for their turn to be served. Situation becomes worse during mealtime or weekend and public holidays. Customers have to face with the risk whether they could get a seat or not when they reach the restaurant. Although there are restaurateurs in Kuala Lumpur and Klang, Selangor area that provide online reservation or call in reservation service, however many aspects have been proved that the existing solutions are not efficient enough.

Customers can only make reservation via online method. This brings up issue where customers that don't have Internet accessibility are not been concerned. Moreover the reliability of the Internet technology is always an issue due to the network transmission problem. Call in reservation service seems to be more convenient than any another reservation method, however as many of us have experienced where there is always no one in the restaurant answer the call after a long wait.

1.4 Project Objectives

The aim of the development of the project is to provide a solution for both restaurant wait staff and customer. There are two classifications of project objectives as described below:

Wait Staff/Restaurateur

a) Provides restaurant staff with a revolutionary new way to exchange information, which increases efficiency and profitability.
b) To computerize restaurant-ordering method in order to eliminate wait staff job and give satisfaction and good service for customers.
c) Provides a fully integrated one-stop ordering process and improve order accuracy and wait time.
d) Eliminating the need to duplicate orders between the tables and the fixed POS terminal/cash register and saves time.
e) Wait staff can spend more time and interact with the customers at the table.
f) Allow orders to be taken remotely by wait staff and directly send to counter and kitchen as real time communication.
g) Improve business image.

Customer

a) Customer can make a reservation at any time by using IVR (Interactive Voice Recognition) system.
b) To provide a solution for customer where they no longer have to queue up and wait for a table.

1.5 Project Scope

This system is targeted to busy, sit-down restaurant with any capacity. Basically the system will be divided into three subsystems, which are Wireless Handheld Order Taking, IVR Reservation and Backend Monitoring. Each of the mentioned subsystems is targeting to three main players involved in a food service interaction, which is restaurant

wait staff, customer and manager/restaurateur. A local area network will be built for the integration of the three mentioned subsystems.

The investigation on the system requirements for the project was conducted at Klang valley. The scopes of the project are described as below:

a) **Wireless Handheld Order Taking**

The targeted user of this system is restaurant wait staff. An application will be built on a handheld equipped with Palm OS, where restaurant menu is display and wait staff can simply take order by touching the screen using stylus pen. No handwriting is needed. The system is also support order list viewing and modification. Order than will be send to the kitchen, bar and counter via infrared.

b) **Interactive Voice Recognition (IVR) Reservation**

Develop an IVR system where customers can make a reservation at any time by call up a number.

c) **Backend Monitoring**

Develop a database or a main server that capability to store the customer order taken by the wait staff, which will then direct the order to be shown on a screen in the kitchen. At the kitchen side, interface is developed to display incoming order and kitchen staff is able to check currently orders for any tables in the restaurant. At the counter side, system will be developed to view the ordered items of each table from time to time. Manager can keep track with the reservation status of the restaurant.

1.6 Project Outcome

The expected outcome of the project are summarized as below:

a) A wireless handheld ordering system will be developed to replace current existing ordering method/system for restaurant wait staff.

b) An IVR (Interactive Voice Response) reservation system will be developed to overcome encountered problems with existing restaurant reservation system such as online reservation, which enable customer calling in to reserve table at any time.

c) The delivered of the whole project will provide better solution for restaurateur; wait staff and customer of the food service industry in terms of transaction speed, time consuming and cost consideration.

1.7 Project Schedule

A schedule has been conducted to ensure that all deserved tasks could be completed on time. Figure 1.0 indicates the planning schedule.

ID	Task Name	Start	Finish	Duration
1	Literature Review	6/11/01	8/22/01	10.6w
2	System Analysis	7/2/01	8/3/01	5w
3	System Design	7/23/01	8/24/01	5w
4	Coding	10/1/01	1/4/02	14w
5	Evaluation and Testing	1/7/02	1/18/02	2w
6	Documentation	6/18/01	2/1/02	33w

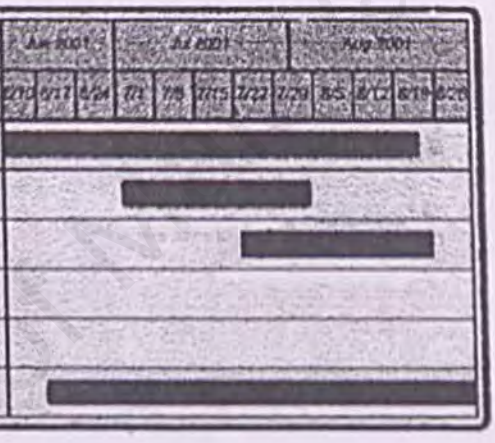


Figure 1.1 Project Schedule

1.8 Summary

This chapter summarizes the aims and objectives of the project. It also explains the problem definition and project limitation. The scopes of the project also cover in this chapter. Lastly the project schedule is developed to help the planning of the development for the project.

Chapter 2 of the project compress the literature review which includes the research of existing system and the comparison between the existing system with the proposed system. There are also research and analysis of the development tools for the system.

Chapter 3 explains the methodology used in developing the system. Techniques of information gathering through interview, Internet and questionnaire will be discussed in details. In additional, explanation of the selected development tools will be included.

Chapter 4 is on the system design. Designing for system data flow, interface and database are specified thoroughly in this chapter.

Chapter 2: Literature Review

Chapter 2: Literature Review

2.1 Introduction

Literature review is an ability that associated to writing and reading. Writing is a behavior to put information on a piece of paper, book or other analogous resources. While reading is a process of seeing and understanding the meaning of a word or symbols that write or print.

Literature review is an early research about a system development. It includes comparison, reference, observation and reviewer that either related or not related to a biography of a person or personality. The main purpose of doing literature review is to ensure the homepage that developed by author are assuring from all the aspects such as quality, attraction and fulfill users' requirement.

In a nutshell, literature review is important to obtain useful knowledge and information that related to develop methodology, which can be used in other development phase later.

2.2 Related Issues

2.2.1 Palm OS Overview

Computers and the Internet have made more information available to more people than ever before in history. How can a company ensure that its employees can get the information they need to make quick, high-quality decisions? The Palm OS® is the standard for handheld computing, a new form of computing focused on helping people manage and access information at any time, in any location. Palm OS handheld devices are becoming the way that everyone manages personal information, accesses and enters corporate data, and mines the richness of the web.

2.2.1.1 Why Products Based On The Palm OS Have Become Standard

Palm Powered handhelds are the systems of choice because they give you the most freedom of choice. Palm Powered handhelds have by far the most users, the most

software programs, the most hardware options, and the most manufacturers; and yet are still the simplest handhelds to learn and use.

2.2.1.2 The future of the Palm OS

Palm and its partners are leading the development of next-generation handheld features by bringing new functionality to users without sacrificing the simplicity and wear ability that have made the Palm Powered handhelds the standard.

Palm is aggressively building the foundation for that future, with a special focus in several areas:

a) **Wireless connections and services**: Palm Powered handhelds already include some of the most innovative wireless communications products on the market, including the popular Palm VII handheld, and Handspring's Visor Phone. Palm and several licensees will release new handhelds with built-in modems and e-mail notification. Bluetooth add-on hardware will be available in 2001, and Palm will build Bluetooth into every Palm-branded handheld as soon as Bluetooth prices drop low enough to allow it.

b) **Secure transactions**: Robust security solutions are already available for the Palm OS.

c) **Graphics and multimedia**: Palm Powered handhelds already have great multimedia options, including voice recorders, photo management software, color screens, and hundreds of games. To support all that extra processing, Palm is also adding support for ARM microprocessors, while still preserving compatibility with the current Palm software base.

d) Palm is also developing MyPalm, an exciting new Web application that gives you online calendaring, web searching, robust browsing, e-mail, and a lot more. Even as Palm and its partners create the future of handheld computing, we will preserve the wear ability and simplicity that have made our products the standard today.

2.2.1.3 Palm OS Platform Architecture

The palm OS consists of five primary components as illustrated in the Figure 2.1 below:

a) Palm OS® software
b) Reference hardware design
c) HotSync conduit data synchronization technology for one-button synchronization
d) Platform component tools including an API that enables developers to write applications
e) Software interface capabilities to support hardware add-ons

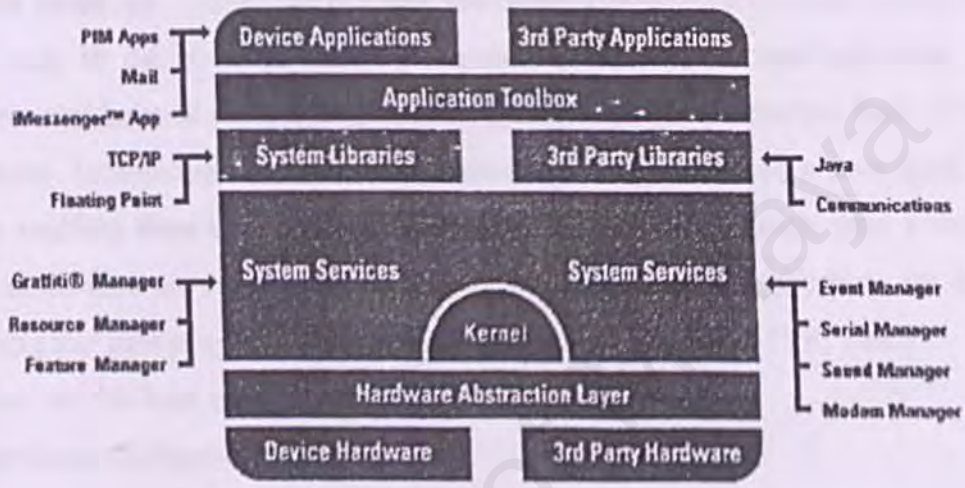


Figure 2.1 Palm OS Platform Architecture

2.2.1.4 Palm OS Application Development Technology

Developed Palm OS applications are compiled into PRC files (Palm Resource file) and then downloaded to the handheld. Development environments are available for creating Palm OS applications in a number of different languages such as C, C++, Visual Basic, or Java. The development environments for Visual Basic, Java, and even some of the C-based development environments require a runtime engine to be present. If C or C++ has been chosen, a free SDK that Palm provides is needed.

A conduit has to be built in order to synchronize data between the application on the desktop and the application on the handheld. Conduits are usually written using Visual C++, Visual BASIC, or Java along with the Palm Conduit Development Kit (CDK). Another needed tool is Palm OS Emulator, software that emulates handheld devices. It is extremely valuable for writing, testing and debugging applications. These

"virtual" devices run on Windows, Mac OS, and Unix computers. [Introduction To Palm OS Programming, 2000]

2.2.2 IVR (Interactive Voice Response) Overview

Interactive Voice Response (IVR) applications enable callers to query and modify database information over their telephone using their own human speech or by dialing digits on their telephone. Callers can use their touch-tone pad to input requests or just say what they want to do, such as ordering a product, obtaining a work schedule, or requesting account balance information, and the database speaks information back to the caller by using Text-to-Speech. IVR offers customers and businesses a new level of freedom by enabling them to conduct transactions 24 hours a day, seven days a week. Businesses of all sizes are realizing the tremendous benefits of IVR applications for their call processing and information delivery needs. [Introduction To iVoice IVR, 2000]

Below are the three types of IVR solution.

a) Touch-tone replacement –
   System prompt: "For checking information, press or say one."
   Caller Response: "One."
b) Directed dialogue –
   System prompt: "Would you like checking account information or rate information?"
   Caller response: "Checking", or "checking account", or "rates."
c) Natural language –
   System prompt: "What transaction would you like to perform?"
   Caller Response: "Transfer $ 500 from checking to savings."

2.2.2.1 Commonly IVR Application

a) Health Care Company
b) Help Desk
c) High Technology Company
d) Human Resources Department
e) Information Provider

f) Insurance Company
g) Order Entry
h) Outdial System
i) Doctor/Patient Reminder
j) Retail Business
k) Telecommunications Industry

2.2.2.2 Evolution of IVR Opportunities

The appeal of personalization and the lure of convenience will mean consumers will be using lots of connect time. You'll retrieve your messages (email, voice, and fax), access a restaurant review, make a reservation, get driving directions, check movie times or buy theater tickets, check stock quotes, and call your friend — all without ever hanging up the telephone or needing to dial more than one number.

Some voice portals are finding innovative ways to generate revenue in addition to the typical Internet advertising model. Potential revenue streams include hosting applications, licensing software for enterprises that want smaller voice portals, and handling voice communication transactions generated by telephone order taking or v-commerce.

Personalization makes these services stick. It creates a convenience and familiarity that users are unwilling to give up once they've tried it. Telephone companies have witnessed this phenomenon with personalized enhanced services, such as voicemail and speed dialing, which not only increase telephone usage but also become highly profitable services on their own.

The pace of Internet growth has created many unmet business and consumer needs for greater customization of Internet access, and that, in turn, has created more opportunities to do business. The growth of the Internet has also produced a pool of technical resources that can be leveraged for voice-driven applications.

For all this, the communications evolution has just begun. The fusion of wireless trends, the confidence of key business players, and the overcoming of technical hurdles is heralding a new way we'll be living, working and playing in the future — by picking up a telephone and just talking.

2.2.2.3 Benefits Of IVR Solution

a) Industry Standard Components
b) Scalable Architecture
c) Turnkey Customized Solution to meet your specific needs
d) Easy to maintain
e) 24 hour access for your customers to interact with you

2.3 Existing System Review

Research was done to find various existing systems available in the market, as well as looking through final year projects done by previous students. The idea, knowledge and experience gained during the research will be used in the development of the proposed system. Various good and relevant features are to be noted, particularly the significance, design and interface used of various systems.

Results of research have been classified into two parts based on the different features of two main subsystems of the Restaurant Ordering And Reservation System, as described below.

2.3.1 Existing Ordering Method/System Review

Based on the research that has been carried out, there are several restaurant-ordering methods existing in the market or system implemented by previous years FSKTM students. Below is the description of each of them.

2.3.1.1 Traditional Order Taking Method (Pen and Pad/Carbonized Pad)

One current system in a restaurant is done using pen and paper. The wait staff takes orders from the customers and writes them down on paper. They might use their own shorthand when there are a lot of customers at one table, and the speed of order taking is important. They may also encode the orders on the paper to reflect who ordered what. After speaking with some of the wait staff, it has been found the most common way to achieve an ordering is by fixing the starting point on one person with obvious

characteristic. Then the wait staffs usually count clockwise from that person, who's usually numbered 1, and number the rest of them accordingly. Each order would then have a little number in the corner to associate the food with the customer. If there are any exceptions in the order, usually the waiter/waitress will write it down beside the order in small print, with some kind of emphasis (for example, circle it) to remind himself/herself. After the order taking is complete, they then go into the kitchen and give the orders to the kitchen staff.

Personal Evaluation

Advantages:

The advantage of this system is that it is familiar to people, therefore it is easy to learn and practice. Also, these skills can be transferred between restaurants. It is also low-tech, so there is no technology to break down.

Disadvantages:

a) Wait staff has to go or sometimes run, depending on the situation, into the kitchen to give the orders to the kitchen staff. That accounts for extra time and efforts, which can be used to do something else.
b) Human errors are likely to occur in the communications between the wait staff and the kitchen staff, due to unrecognizable handwriting or messy paper with food spills.
c) Lots of walking done by the wait staff; in fact, the wait staff spends most of the night walking back and forth between their tables and the counter/kitchen.

2.3.1.2 Automated Machine: Touch Screen Computer

There are some restaurants that already implement some type of automated mechanism. Most of their automated systems are touch-screen computers. The wait staff takes orders from the customers first by jotting them down on some paper, then walk over to one of the computer terminals and input them into the computer system located at the section. Then these orders go through a connected network and appear on the computer terminals for the kitchen staff in the back.

One of the touch screen product in the market is MicroSale [About MicroSale], as shown in the Figure 2.2 below.

Figure 2.2 MicroSale Touch Screen POS

This is the system that uses by most of the restaurateurs in Malaysia that using touch screen ordering method such as café in JW Marriot, Carmen's Seafood & Wine and Le Vogue, Renaissance Hotel.

Personal Evaluation

Advantages:

a) Unlike keyboards, intuitive touch interface is simple to use, reducing wait staff training time and improve productivity.
b) Response accurately and quickly to any touch input – fingernail, credit card, pen, even to food prepares wearing gloves.
c) It eliminates the walking back and forth after the server took orders from the customers, thereby increase efficiency.
d) Less human errors between the communications between the servers and the kitchen staff.
e) Both the wait staff and the kitchen staff are working with a standard input/output device. Therefore, repeated operations will increase efficiency since factors like different handwriting will be eliminated.

Disadvantages:

a) Wait staff may do damage of the touch screen since it is very sensitive.
b) Process of inputting customer orders actually occurs twice. The server writes them down first on paper then inputs them again into a computer. If there are exceptions with customer's orders, the waiter/ waitress would have to write them down on paper,

then re-key in them once again into the computer.). This decreases the efficiency of the whole process.

c) If the wait staff chooses not to write down the orders, in order to limit their redundant work, they are then heavily taxing their working memory.

d) There are generally only a couple of computer stations in the whole restaurant. When it gets very busy, a process is needed to organize the server activities, so they do not all need to use the terminals at the same time. However, there is no such process in place. Therefore, when it is busy in these restaurants, a lot of time is wasted when servers wait in line to input orders to the computers.

e) More wait staff is needed because so much time is spent walking. This leads to slower service or the restaurant needs to hire more wait staff to cover the tables.

2.3.1.3 Interactive Menu Selection (Pervious Years Student Project)

Interactive Menu Selection is a system developed by a previous FSKTM student, Wendy Jiliun, 1999/2001. Basically the system consists of three modules, which are management of menu, management of service and management of capacity. The main feature of the system is to provide a better solution for restaurant orders taking.

By using this approach, each table in the restaurant will be equipped with a computer and a mouse. Each of the computers consists of program that lists out the restaurant menu. Things that customer allows to do are as below:

a) Customers can browse through the listed menu that consists of item price and description.

b) Place order, modify order or delete order and send the order by clicking several buttons using mouse. The order then will be send to the kitchen and counter via a local network connection.

c) Customer also able to choose preferred payment method such as pay by credit card or by cash.

In this case, restaurant wait staff is not there to serve the customer. The customer itself does all the process of order taking.

Personal Evaluation

Advantages:

a) Customer can browse the listed menu on the screen as long as they want without the assistance of wait staff.
b) Reduce labor cost due the number of wait staff in a restaurant can be reduced.
c) Orders directly sent to the kitchen and counter, which increase order transaction speed.

Disadvantages:

a) Customer might do damage of the computer peripheral or system and restaurateur has to invest extra cost for the maintenance purpose.
b) Not efficient for those customers who are not familiar with computer or less of computing knowledge.
c) Customer might felt that the system is really frustrated since they need to navigate through many pages in order to place an order.
d) Conflicts or misunderstanding might be happened since there is no communication between the customer and wait staff. Ordered items are only based on the data in the database, where some times the customer will claim that he or she didn't order a certain dishes or wrong order has been placed.

2.3.1.4 Wireless Handheld Ordering System

This solution uses a handheld together with a stylus instead of pen and pad or touch screen for order taking purpose. The total system contains the handheld computers that have wireless communication capabilities, as well as supportive hardware. A computer system or server with wireless transceivers would reside hidden in the restaurant. Wait staff enters orders by tapping buttons on the handheld screen with a stylus. This system would receive signals from all the handheld in the restaurant and order them in a coherent display for the kitchen or bar staff and sent to the counter as well. [Case Study - Touch, Order And Eat, 2000]

Figure 2.3 Wireless Handheld Ordering

Currently there are none of the local companies in Malaysia that sells restaurant management system provides the similar wireless ordering solution for the restaurateurs. Based on the research that has been carried out, only Datascan Malaysia Sdn. Bhd. has now involved in the development of the similar system but the product is not in the market yet. 21st Century Restaurant system is one of the existing wireless handheld ordering products of other countries, developed by Ameranth Wireless. [Product: Overview, 2001]

Table 2.1 Ameranth's 21st Century Restaurant System Requirements

System Requirements	
Wireless Hardware	Microsoft® Windows® Powered Pocket PC Handheld Computers (CE 3.0) with radio Card
	802.11 FH Wireless Local Area Network (WLAN) access point
	Mobile, Wireless Printer with IrDA port
Back Office Software	Windows® 2000 OS/NT 4.0 -IIS Server 4.0 or later -IE 4.0
	3rd Party Point of Sale (POS) System
Back Office Hardware	Pentium III (400Mhz or better) Processor
	64MB RAM (128MB or more recommended)
	Serial Port for WLAN access point connection

Table 2.2 Ameranth's 21st Restaurant System Features And Benefits

Features	Benefits
Clock-in/Clock-out	Remote access to time card applications
Log-in/log-out (password protection)	Servers only have to enter their password once on the handheld. All orders are identified in the POS system.
Order by table and seat #	Pivot seating enables a runner system
"Fat finger friendly" buttons	Screens can be activated either by touch or by stylus.
Preview order	Server sees order in its entirety before sending it to the kitchen.
Item modifiers	Forced modifiers prevent the server from leaving the table without vital information. Guests may completely customize their orders.
Edit & delete items	Changes are possible until orders are sent.
Hold & fire items	The order's timing is controlled remotely.
Routes orders to designated printers	Splits and sends order to appropriate places for preparation. (Hot/cold/bar printers)
Send order to wireless payment printer	Receipt may be generating right at the table.
Authorize credit cards	Credit cards may be swiped at table, where the customer never loses sight of it, for increased security.

Personal Evaluation

Advantages:

a) Walking for the wait staff from the crowded customer area to the kitchen and back to deliver the order is eliminated

b) Since all orders are transcribed to the central server and stored there, there are always back-ups.

c) Eliminating the need to duplicate orders between the tables and the counter and saves time. Wait staff able to turn over tables more quickly and manage bigger sections of the restaurant.

d) Quicker, more accurate orders. Less human errors between the communications between the servers and the kitchen staff.

Disadvantages:

a) Not completely comfortable writing with that type of pen (stylus) or using that type of device (handheld). That kind of device might not have the same "feel" as when writing on paper using pen.
b) Server down or problems with wireless connection.
c) Investment in purchasing the system and needed hardware.

2.3.1.5 Comparison Between Pen & Pad, Touch Screen And Wireless Ordering Method

Table 2.3 Ordering Method Comparisons

	Pen & Pad	Touch Screen	Wireless Handheld
Order Transaction Speed	Slow	Medium	Fast
Order Accuracy	Fair	Excellent	Excellent
Customer Satisfaction	Mostly Dissatisfied	Satisfied	Mostly Satisfied
Purchase Cost	Low/Non	High	High

Table 2.1 is the summary of the comparisons between pen and pad, touch screen and wireless ordering method which illustrate the advantages and disadvantages of each method that have been mentioned in the above few section.

Basically the functions provided by each of the existing method for an order taking are the same. Things that make differences are based on the effectiveness of each approach.

In the terms of order transaction speed, pen and pad is the slowest method since it involves of walking done by the wait staff between table, counter and kitchen. For touch screen, this method is faster than pen and pad method because the order is directly sent to the counter and kitchen after inputting the order in the machine. However, as compare to the wireless handheld method, it is much slower since wait staff need to re-input the order that already jotted down on a paper at the table into the touch screen system. Wireless handheld is the fastest method in terms of order transaction speed as the order is directly

sent to counter and kitchen via wireless local area network whenever the wait staff taps in the order using handheld.

Misunderstanding or misinterpretation by kitchen staff or cashier of wait staff handwriting might be happened. This could bring to a serious impact of the order accuracy. Additional works such as void an order have to be done which will then follow with the waist of food and poor service image. These problems would not be happened with touch screen and wireless handheld method since all the menu items are saved in these systems, no handwriting involve.

Finally we can come to a conclusion where wireless handheld ordering method could mostly overcome problems that occurred by using the other two methods. Customers are pleasant with restaurant that use the wireless system where they might thought that the restaurant is not only providing good food, but also concern about the provided service and customer satisfaction.

Since wireless handheld method involves the implementation of latest technology, cost to purchase the system is the highest among the three methods. Not only the cost of the software itself, but also another peripherals such as the handheld, server and the need to set up the wireless communication within the restaurant. Touch screen system is also expensive to be purchased since it also consists of additional hardware such as the touch screen itself. Another reason is both of the systems are not sold just for ordering purpose, but together with others restaurant management features for accounting, employee, inventory control and cash. Restaurateurs are forced to buy the whole system if they want to use these two ordering methods, which is a waist of investment especially for those who want to remain with their existing method for management of accounting, employee, inventory control and so on. As compare with these two ordering method, cost for pen and pad method is the cheapest since it does not involve any computer system and hardware.

2.3.1.6 Comparison Between Proposed Wireless Handheld Order Taking Subsystem With Ameranth's 21st Century Restaurant System

Ameranth's 21st Century Restaurant system is an integrated wireless software system for seating, serving, ordering, processing payment and valet parking that works

with existing IT systems. The ordering function of this system is based on the same concept or similar with the wireless handheld ordering subsystem of the proposed project as described in the earlier section 2.3.4.2.

Table 2.4 Ameranth's 21st Century Restaurant System Vs. Proposed System

	Ameranth	Proposed System
Wireless Communications	**RF (Radio Frequency) wireless** - High cost - Materials in between affect radio propagation	**Infrared** - Lower cost
Operating System	**Windows CE** - Need more memory storage - Application runs slower - Win CE enabled handheld is more expensive	**Palm OS** - Less memory storage needed - Application runs much faster - Lower price for Palm OS enabled handheld
System Design	More steps needed to be performed for an order taking	Fewer steps needed to be performed for an order taking

As shown in Table 2.4 above, Ameranth's system is using RF wireless technique as the communication purpose, while the proposed system is using infrared technique. Even RF supports communication ranges form 50 feet to several hundred feet depending on where the access point is, but materials that exist between the wireless client and the access point (receiver), even plants or human body will the can affect the radio propagation. This problem surely will cause system failure and unsuccessful transfer of order. Besides that, cost to set up a wireless local RF communication environment is much expensive than using infrared technique. A requirement for the infrared approach is only a computer plugged with an infrared receiver and the transfer rate would be 4 megabits per second. One issue that may occur of using infrared technique is only the ranges limitation, where more access point needed to be set up.

Windows CE is running on the handheld of the Ameranth's system. The total RAM of the Windows CE enabled handheld in the market now is within the range of 4 – 16 MB. Meanwhile, the RAM of Palm OS enabled handheld is 2 – 8 MB. As what can be seen here, the Windows CE technology seems to grow faster that what Palm Os does. However, it has been proven that application that running on Windows CE device is much slower than Palm OS device. The reason behind is because Windows CE operating system is based upon the Win32 API. This means that all programs and data formats must conform to and recognize this Applications Program Interface. For this reason, even with the additional remaining RAM, the Windows CE device can store just over 1/3 the amount of the same types of data as the Palm III. Further, this need for increased RAM takes a serious toll in battery longevity. [Leah's Palm Pilot Page] Palm OS would be the clear choice to be used as for handheld solution since the speed of data retrieval and data sending is highly considered in the case of order taking.

Ameranth's system is less user friendly as compare with the proposed system. One of the reasons is the slow of data retrieval due to the used of Windows CE as mentioned above, where wait staff have to wait for the menu to be loaded into the handheld. Another reason behind is the design of the system. Wait staff have to navigate through many interfaces in order to complete a single order taking. The proposed system would be more user friendly in which the steps need to be performed will be eliminated and task to perform an order taking could be completed much faster.

2.3.2 Existing Restaurant Reservation System Review

2.3.2.1 Walk In Reservation

Customers come to the restaurant personally to reserve table. His or her name will be jotting down, as well as the details such as reserve date and time, number of customers and others enquiries. The customer only needs to mention his or her name when they come to the restaurant later then.

Personal Evaluation

Advantages:

Directed communication between customer and restaurant. Customer could express their enquiries to the restaurateur.

Disadvantages:

Customers need to go to the restaurant personally. Not efficient and waist of time.

2.3.2.2 Call In Reservation

This is a common and widely used method among most of the restaurants in Malaysia. Customer phones the restaurant to make a reservation, which he or she will then be given a reference number by the restaurant staff that answers the call. Meanwhile, customer contact number will be taken. When the customer comes to the restaurant later, he or she can refer to the restaurant staff by mention the reference number. One of the fast food restaurants in Klang valley that use this approach is Pizza Hut.

Personal Evaluation

Advantages:

a) Directed communication between customer and restaurant. Customer could express their enquiries to the restaurateur.

Disadvantages:

a) Customer might hold the phone for so long when the restaurant is busy and none of the staffs is free to pick up the call.
b) Customers need to repeat calling the restaurant when the line is engage.
c) Human errors such as miscommunication between customer and restaurant staff will cause to the record of incorrect reservation information.

2.3.2.3 Online Reservation

The Online Reservation System is created for a restaurant to show menus, keep track of booking activities and store the necessary information. This system allows the customer to book online by accessing the restaurant web site. From the many different types of online booking systems in Malaysia found on the Internet, an online reservation

system using by T.G.I The American Restaurant has been chosen for discussion. Figure 2.4 is the table reserve input form of the reservation system. [Reservation]

Customer that want to book online have to fill in a form where they need to input information regarding name of booking, number of guest, smoking preference, date, time, telephone number, fax, email and remarks. After the restaurant process the reservation, an email with a reference number will be sent to the customer for confirmation.

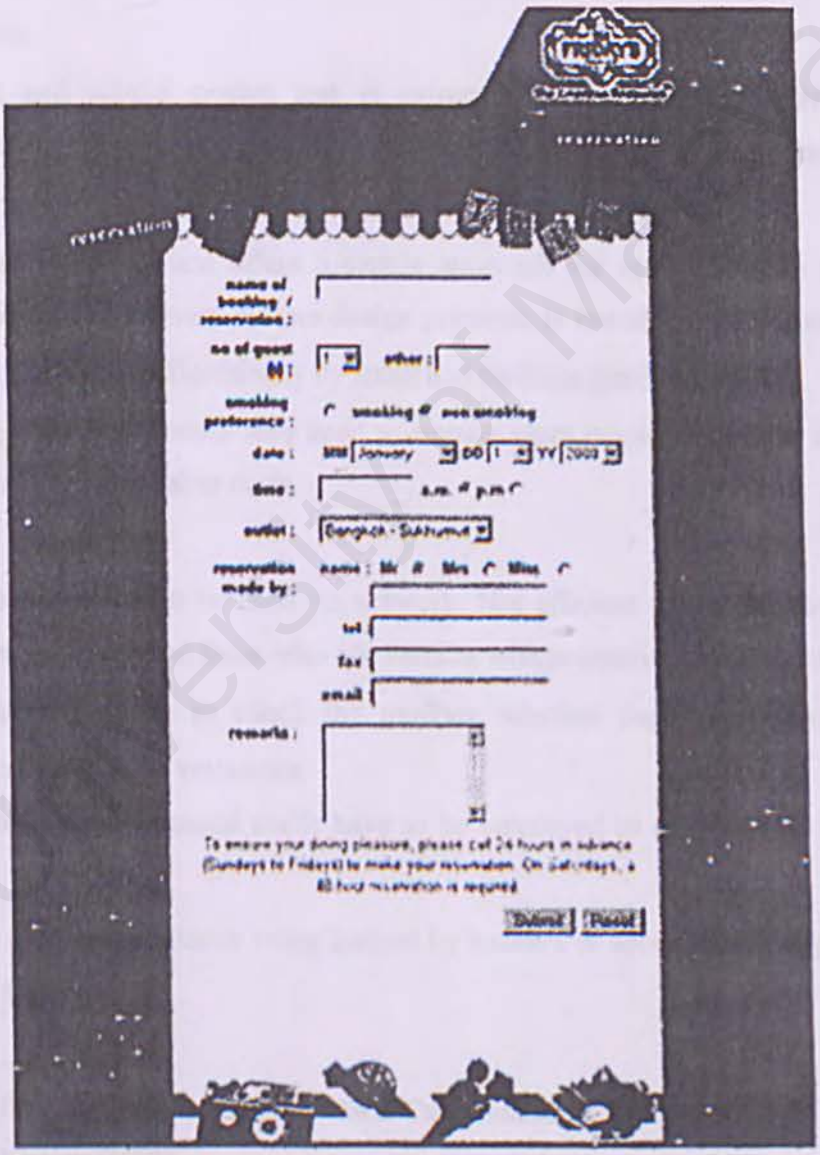


Figure 2.4 T.G.I The American Restaurant Online Reservation Form

Personal Evaluation

Advantages:

a) Customer can make a reservation at any time; any place by accessing the restaurant web site. This system is very appealing to time-conscious customers and customers who is unable to go to restaurant easily

b) Avoid human errors such as miscommunication between customer and restaurant staff that will cause to the record of incorrect reservation information. Customer can read through and input the reservation information that they prefer and submit the reservation form.

c) Fast, efficient and simple system that is extremely user friendly, features self-explanatory icons and graphics, customers just have to do a simple 'point and click' of a mouse to select.

d) The online reservation system offers a simple approach for restaurateur to manage table reservations. The primary system design principle is based on the requirements of manageability and cost affordability by small and medium sized restaurants.

e) Without the system, restaurateur may need to employ more employees as for the front desk and will increase the labor costs.

Disadvantages:

a) Online system just only can be used via network. Not efficient for those who do not have Internet assessment and those who not familiar with accessing the Internet.

b) Customers have to online to check the mailbox whether they have been sent a conformation mail from the restaurant.

c) System maintenance. Additional staffs have to be employed to manage and maintain the system.

d) Not save and not reliable. Easily being hacked by hackers or server down might cause to the system failure.

2.3.3 Existing IVR Application Review - DiGi Call Centre Interactive Voice Response System (IVR).

Currently there is no IVR reservation system for restaurant found in the market. However there are many IVR applications that are used for others means such as TGV

Cinema IVR Ticket Booking System and Digi Call Center IVR System. Digi Call Center IVR System has been chosen as a review of an IVR application.

Introducing the dynamic teleinfo system - the DiGi Call Centre Interactive Voice Response Systems (IVR). Another mode of access to the DiGi Customer Service - everything user want to know about digi service and more, all at the tips of the fingers! All they needed is a DiGi Mobile or any touch-tone phone. With the extremely simple and user-friendly DiGi Call Center IVR, user can now have quick access, to not only the latest accurate information DiGi service and promotions, but also importantly, on the Network Fault Reporting status.

Users can also perform a majority of their personal account functions in complete privacy such as checking of account balance, or requesting for monthly bills (up to 3 months) via mail, e-mail or fax or even check your Interactive Mobile Services status. The LAST 6 DIGITS of the users ACCOUNT NUMBER (refer to bill) will be their Telephone Personal Identification Number (TPIN) to access their DiGi account information. Users are also advised to change the T-PIN for added security. They may personally change the T-PIN anytime by accessing DiGi Account Information via the IVR system.

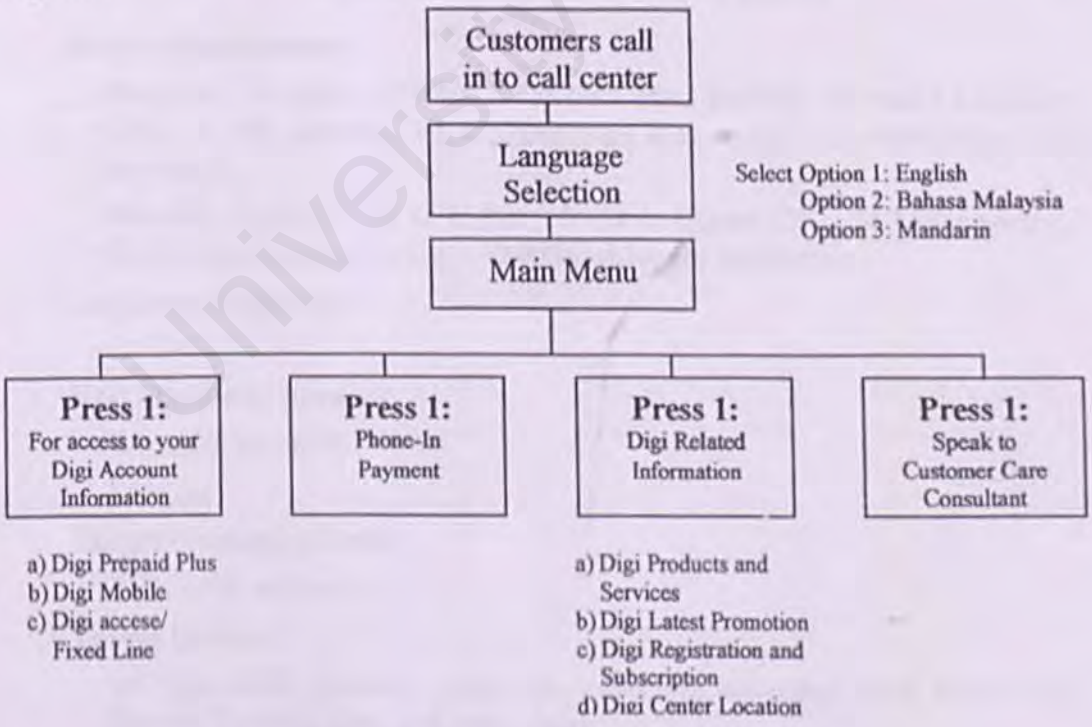


Figure 2.5 Flow Chart Of Digi IVR Call Center

2.4 Consideration Of Development Tools

2.4.1 Palm OS Application Development Tool

2.4.1.1 CodeWarrior - C and C++

CodeWarrior for Palm OS platform is the development tool of choice among Palm OS® platform developers. Software programs that run directly on a Palm OS handheld could be created from the comfort of the Windows 95/98/NT/2000 or Mac OS computer using the award-winning CodeWarrior Integrated Development Environment. [CodeWarrior, 2000]

a) Tightly integrated C/C++ compiler, source- and assembly-level debugger, assembler, and linker.
b) Test and debug applications more rapidly with a direct-to-device debugger, Palm OS Emulator (Windows and Mac OS), or Palm OS Simulator (Mac OS).
c) Build graphical user interfaces quickly using Constructor™ for Palm OS platform; drag and drop elements from a palette onto a simulated screen and edit the interface visually.

Table 2.5 CodeWarrior Product Details

System Requirements

Windows: Windows 95/98/NT 4.0 with Intel Pentium or AMD K6-class CPU. 24 MB memory, 90 MB free hard disk space, CD-ROM drive for installation.

Mac OS: System 7.5.3 or higher, 68020 or higher CPU, 24 MB memory, 90 MB free hard disk space, CD-ROM drive for installation.

Languages Supported

C / C++

Host Operating Systems

Windows 95/98/NT

Mac OS

Target Operating System

Palm OS® software

Target Devices

All Palm OS® platform connected organizers, including those from IBM, Symbol Technologies, and Qualcomm.

Printed Documentation

Targeting Palm OS® Documentation

Target Processor

Motorola® 68328 Dragonball

Project Manager

Uses project paradigm to manage source code files, libraries, and resource and even other projects

Handles all interdependencies between code files, libraries, and resource libraries

Supports Multi-threading

Supports modular projects

Lists files in the project in a user-configurable hierarchical view

Creates and manages application resources, forms and controls, menus, character strings, string lists, category names, alerts, and Icon and bit maps

Displays the size, in bytes or kilobytes, of the compiled executable object code for files and groups

Shows the size, in bytes or kilobytes, of non-executable data in the object code for files in the project

Indicates whether the IDE should instruct its compilers and linkers to generate debugging information

Tracks which files have been modified since the last build of the project; CodeWarrior® will only compile those files which have been touched, speeding the build process

Compilers

ANSI C compliant C Compiler

ANSI/ISO compliant C++ compiler

Editor

Auto-indenting

Syntax Highlighting

Automatic balancing for braces, brackets, and parenthesis

Routine & interface pop-up menus

Integrated with Class Browser and Debugger

File & Folder comparison

Debugger

Fully integrated direct-to-device source-level debugger lets you debug your application from the CodeWarrior IDE

Targets Palm OS® Emulator for Windows and Mac OS

Supports Palm OS® Simulator for Mac OS

Detects HotSync® application and automatically terminates it before debugging

Provides console memory commands that work with Palm OS® Emulator and Palm OS® platform devices

Displays subroutine call chain

Displays executing local variables and source code

Displays your program as source code, assembly language or both

Displays list of all source files associated with current target

Displays list of all routines defined in the selected source code file

Displays all global variables used by your program

Displays blocks of memory as array elements and allows content to be edited

Displays the contents of memory in hexadecimal and corresponding ASCII character values

Displays CPU registers and allows their content to be edited

Displays current processes running, including hidden processes

Highlights variables & registers which change at each step of program execution

Class Browser

Displays a comprehensive view of all data

Displays all data from a class-oriented perspective

Displays graphical class hierarchy in a tree structure

Features

CodeWarrior IDE v3.1

Palm OS 3.0 SDK (available with **product registration**)

C / C++ compilers

Constructor for Palm OS® platform

Palm OS® Emulator (Windows and Mac OS)

Palm OS® Simulator (Mac OS only)

Symbol SPT family Scanner Library

CodeWarrior IDE documentation and viewing applications

Palm OS® platform documentation and tutorials

Examples of Palm OS® applications

30 day money-back guarantee

Support for Japanese user interfaces using Constructor™ and Japanese application development (includes Palm OS® SDK version 3.1)

Support for Palm VII™ development (includes Palm OS® SDK version

3.2)
Symbol Technologies printing libraries
Handspring API reference book

2.4.1.2 AppForge – Visual Basic and RAD

AppForge™ software offers the fastest way to create applications for PDAs, phones, barcode scanners and other Palm OS® devices. The software integrates into Microsoft® Visual Basic® 6.0 to give user the power of turning ideas into finished products in record time.

A PC used to develop AppForge applications should have a minimum of:

a) IBM-PC compatible computer
b) Intel Pentium® or equivalent processor, 90 MHz minimum or faster
c) Windows® 95, 98, NT, or 2000 operating system
d) Microsoft® Visual Basic® 6.0 (Service Pack 4 installed)
e) 32 MB of RAM
f) VGA adapter with 256 colors (16-bit color recommended)
g) 20 MB available hard drive space
h) Serial or USB ports, as needed

Table 2.6 AppForge Features

Feature	*Feature Description*	*Personal v. 1.2.1*	*Standard v. 1.2.1*	*Professional v. 1.2.1*
Features				
The AppForge PDB Library	Provides a set of methods to manipulate a Palm OS® Database (.PDB).	X	X	X
Palm OS® Extended Functions Library	A collection of Palm OS® specific functions not included elsewhere	X	X	X

	in AppForge.			
Graphic Viewer/Converter	Converts Windows .BMP files to the efficient Appforge .RGX graphic file format.	X	X	X
Universal Conduit	Allows databases to be synchronized between AppForge-created applications and ODBC data sources without writing code.		X	X
TrueType® Fonts	Facilitates use of licensed third party TrueType® fonts on Palm OS® devices.		X	X
Movie Viewer/Converter	Converts AVI files for use with the Movie Ingot.		X	X
Wireless Internet Support	Send and receive data wirelessly (with a Palm® Powered device with wireless capabilities)			X
Palm OS Extensibilty Library	Allows AppForge applications to call other Palm applications, shared libraries, and extensions.			X

2.4.2 IVR Application Development Tool

2.4.2.1 Parity Software

The Parity software lines of toolkits have evolved into the Computer Telephony (CT) Application Development Environment (ADE). The CT ADE Version 8 enables users to easily develop applications using the equally robust functionality of the

Graphical VOS or the CallSuite ActiveX programming environments. Developers now have a choice of two programming interfaces or environments within the enhanced CT ADE - Graphical VOS, a powerful scripting language, which offers a graphical user interface (GUI) as well as a debugger, and CallSuite ActiveX controls, which incorporate directly into Windows visual programming environments such as Visual Basic to provide telephony functions. If this is chosen, the CallSuite ActiveX controls incorporate directly into the visual programming environment, providing CT-specific development functions. [Topaz, 2001]

The Computer Telephony (CT) Application Development Environment (ADE) is a set of development tools and programming interfaces that help shorten both your time to market and your time to revenue by making it quick and easy to build robust, portable CT applications. The CT ADE mitigates the need to write directly to the API in C or C++. The Topaz architecture is an abstraction layer that sits on top of an API and performs low-level CT tasks. Without having to worry about these tasks, you'll have more time to focus on building innovative

Parity software features and benefits are listed below:

a) Systems Requirements

CT ADE is designed and tested for Windows NT and Windows 2000.

b) Multi-Language Support

Helps You Go Global by supporting multilingual applications with few code changes. Add new languages and new data types (colors, Zodiac signs....) yourself without writing new code.

c) CT Media

Supports CT Media server software, which makes it possible for telecom applications to share a server and its technology hardware—providing an economical and extensible platform for adding services without duplicating hardware.

d) GlobalCall/SS7

Topaz supports all technologies supported by GlobalCall, including SS7. Topaz allows you to write code once and support all GlobalCall protocols.

e) Voice Recognition

SpeechWorks Voice Recognition v6.5, Nuance Voice Recognition v7, Philips Speech Pearl 2000 Voice Recognition

f) Text-To-Speech

SAPI v4.0 Text-To-Speech

2.4.2.2 iVoive IVR

iVoice IVR allows development of custom applications in a visual atmosphere. iVoice IVR provides a software development toolkit, complete with a graphical user interface, providing 32-bit interactive voice response capabilities for the Windows NT platform. All applications are built using a fast, efficient drag and drop system.

The Command Blocks Palette allows you to click on any command block and drop it into the simple to use, graphical interface of Insight IVR. Each command block is completely customizable and arranged in groups by the function each will perform: VoiceMail functions, Database Functions, Date and Time functions, Text File functions, String functions, and finally other useful functions.

Commands Drag and Drop to execute an application. iVoice IVR can also read and write to the most popular databases, including Microsoft Access, Microsoft Fox Pro, dBase, Microsoft Excel, Paradox, Btrieve as well as simple text files.

In addition to a broad range of database support, iVoice IVR provides a speech recognition engine that allows callers to speak responses to the IVR system. In addition, iVoice IVR provides clear, accurate text-to-speech for reading information back to the caller in real-time. [Screen Shots Of iVoice IVR, 2000]

iVoice IVR can operate on a stand-alone server quality computer or on an existing PC so long as the system will always be up and running. Minimum system requirements are:

a) IBM PC/AT based on Pentium I 233MHz (or higher) processor.
b) Sixty Four (64) Megabytes RAM
c) 1.44 MB Floppy Drive.
d) Minimum 4.0 GB Hard Disk (Note: 10 MB. 1 Hour of voice).
e) 56K Hayes Compatible MODEM. (3Com U.S. Robotics Recommended)
f) VGA Card.

g) SVGA Monitor

h) Keyboard and Mouse

i) Port Voice Processing Boards. (Up to 12 boards per system)

2.4.3 Programming Language

2.4.3.1 Visual Basic

Visual Basic is a high level programming language evolved from the earlier DOS version called BASIC. BASIC means Beginners' Allpurpose Symbolic Instruction Code. It is a fairly easy programming language to learn. The codes look a bit like English Language. Different software companies produced different version of BASIC, such as Microsoft QBASIC, QUICKBASIC, GWBASIC, IBM BASICA and so on.

Visual Basic is a visual and events driven Programming Language. These are the main divergence from the old BASIC. In BASIC, programming is done in a text-only environment and the program is executed sequentially. In VISUAL BASIC, programming is done in a graphical environment. Because users may click on a certain object randomly, so each object has to be programmed independently to be able to response to those actions (events). Therefore, a VISUAL BASIC Program is made up of many subprograms, each has its own program codes, and each can be executed independently and at the same time each can be linked together in one way or another.

2.4.4 Operating System

2.4.4.1 Window NT Server 4.0

Microsoft® Windows NT® Server 4.0 is now a better choice than ever. With the new features introduced with the Windows NT 4.0 Option Pack, Windows NT Server is the most complete platform available for building and hosting Web-based applications, and the easiest server operating system available. You will be up and running less than an hour after you take it out of the box. It's so flexible and compatible you will realize significantly reduced hardware and software costs. You will experience far less downtime thanks to its reliability and easy management. Benefits of Windows NT Server 4.0 are listed below:

a) Windows NT Server 4.0 was designed to help developers build and deploy business applications faster than ever before. The Option Pack integrates new Web, transaction, scripting, component, and message queuing services directly into Windows NT Server 4.0.

b) New management tools in Windows NT Server 4.0 and the Option Pack help you set up Web sites, manage content, and analyze usage patterns to improve your site as it evolves.

c) Multiple Web sites on a single machine, innovative Web publishing features, customizable tools, and new wizard technologies make Windows NT Server 4.0 the best platform to publish and share information securely over corporate intranets and the Internet. [Product And Technology Catalog, 2001]

2.4.4.2 Windows 2000 Server

Microsoft® Windows® 2000 Server is the easy way to Internet-enable your business. As businesses come to rely more and more on the Internet, they have the opportunity to grow, extend their networks to partners and customers, and consider new ways to bring their products and services to market. To take advantage of these opportunities, businesses need an infrastructure that can readily respond to market forces, delivers high reliability, efficient management, ease of use, and supports the latest advances in networking hardware. And to readily pursue these opportunities, businesses want to build on their existing investments in skills and systems.

Windows 2000 Server is designed to meet these needs for businesses of all sizes, from small, centralized organizations to the largest distributed enterprise. Building on the strengths of Windows NT Server 4.0, Windows 2000 Server sets a new standard for how well an operating system can be integrated with standards-based directory, Web, application, network, file and print services, powerful end-to-end management and reliability, to provide the best foundation for integrating your business with the Internet. The "Business Internet" starts here. The Windows 2000 Server Family is built on the strengths of Windows NT and delivers this powerful product: Windows 2000 Server includes the multipurpose capabilities required for workgroups and departmental

deployments of file and print servers, application servers, Web servers, and communications servers.

2.4.5 Database Management System

2.4.5.1 Microsoft SQL Server 7.0

Sybase originally developed the SQL product in the mid-1980s. Microsoft partnered Sybase ended their partnership. Microsoft's SQL Server has grown to be a huge success in the RDBMS market. There are several advantages of Microsoft's SQL Server. SQL Server provides direct Internet support through the SQL Web Assistant and Microsoft's Internet Information Server (IIS). The SQL Web Assistant is including with version 6.5. It generates HTML Scripts for SQL Server data. This product allows you to create web pages that contain SQL Server data. SQL Server also provides direct support for Microsoft's IIS product, which means that complete Internet solutions can be delivered through the combination of SQL Server, NT and IIS.

SQL Server delivers improved performance over previous versions through enhancement such as reduced checkpoint serialization faster sorting and indexing, and improved integration with the NT Operating System version 6.5 also offers several new counters to help tune SQL Server for maximum performance.

Microsoft's SQL Server allows two billion tables within each 32767 databases to be defined. The number of rows in a table is effectively unlimited for SQL Server. It allows user to define up to 250 columns for each table. SQL Server allows user to combine columns from as many as 16 tables in a single query.

2.4.5.2 Microsoft Access 2000

One of the easiest ways of creating a database is by using Microsoft Access. This is because it has an easy menu driven interface that lets the user issue commands without an in depth understanding of Access. At its most basic level, Access can be used to develop simple personal database management system.

Access is an excellent platform for developing an application that will run a small business. Its wizards allow developers to quickly and easily build the foundation of the application. The ability to build code modules allows developers to create code libraries

of reusable functions, and the ability to add one behind forms and reports allows them to create powerful custom forms and reports.

2.5 Summary

As a whole, literature review is very important to the development of a project as all information relevant to the project are thoroughly analyzed and reviewed. Next, we shall move on to Chapter 3 where we discuss the methodology for the project, as well as recognizing the requirements of the system.

Chapter 3: Methodology

Chapter 3: Methodology

3.1 Introduction

Methodology and system analysis are early phases in development system. It involves identification of functional and non-functional requirements. This chapter focuses in the aspects of analyzing the information obtained so that it can be incorporate into the system. System analysis is the process of understanding broader aspects of the system that would be required to solve problems. The overall emphasis is to gather information obtained and use this information to consider other alternatives possible before core holding that best solution for system. The analysis is done first to obtain requirements for the system. Then methodology is included into this chapter to see how the project will be developed. Synthesis is done from existing system and some features will be adopted into the propose system. Tools and languages for development will e discussed and the determined for the development of the project.

3.2 Methodology

A Methodology is a systematic way of accomplishing certain tasks and may be defined as a collection of procedures, techniques, tools and documentation aids to help the software developer speed up and simplify the software development process. [Michael, 1999]

There is no one precise approach to develop a system; every development method has its strength and drawback. It depends on circumstances they did, applied and people who involved in the development activities. Among all the available models, Prototyping and Waterfall approach had been chosen for discussion.

3.2.1 Waterfall Model

3.2.1.1 Overview

Waterfall Model, illustrated in Figure 3.1, where the stage are depicted as cascading from one to another. As the figure implies, one development stage should be completed before the next begins. Thus, when all of the requirements are elicited from

user, analyzed for completeness and consistency, and documented in a requirements document, then the developer can go on to system design activities. The waterfall model presents a very high-level view of what goes during development, and it suggests to developers the sequence of events they should expect to encounter. [Sommerwille, 2001]

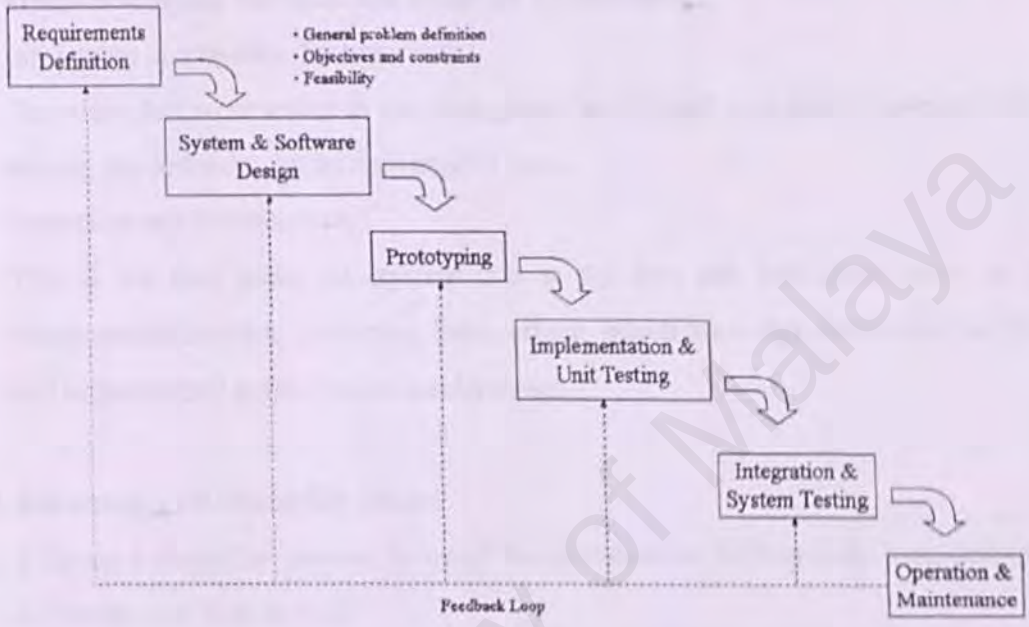


Figure 3.1 The Waterfall Model

The waterfall model can be very useful in helping developers lay out what they need to do. Its simplicity makes it easy to explain to customers who are not familiar with software development; it makes explicit which intermediate products are necessary in order to begin the next stage of development. [Pfleeger, 2001]

Below is the description of each stage of the waterfall model.

1. Requirements Definition

   The system's services and constraints are established so that development can be done according to the needs of users.

2. System and Software Design

   This stage establishes the overall system architecture. The system design partitions the requirements into hardware or software.

3. Prototyping

   Prototyping is a process to come up with a rapid system for the purpose to validate the use requirements.

4. Implementation and Unit Testing

   The programs or components of the system are tested individually. Unit testing involves verifying that each unit meets the specification.

5. Integration and System Testing

   The units that were tested is then integrated and tested as a whole system. After testing, the software can be delivered to users.

6. Operation and Maintenance

   This is the part when the system that is put into use will have errors in it. Maintenance involves correcting these errors, which were not discovered earlier, and improvement to the system can be done.

3.2.1.2 Advantages Of Waterfall Model

a) It forces a discipline process to avoid the pressures of writing code long before it is known what is to be built.

b) It is much easier to build something if it is known what that something is.

3.2.1.3 Disadvantages Of Waterfall Model

a) There is no room for mistakes and no process for error correction after the final requirements are released.

b) The waterfall methodology builds products that, by the time they are delivered, are obsolete.

c) There is no early feedback from the customer.

d) Many times, once the customers see what they could get, the customers want something entirely different then what they said they wanted in the first place.

e) The waterfall methodology puts so much emphasis on planning that in a fast moving target arena it can not respond fast enough to change.

3.2.2 Prototyping

3.2.2.1 Overview

A prototype is a smaller-scale, representative or working model of a proposed design for an information system.

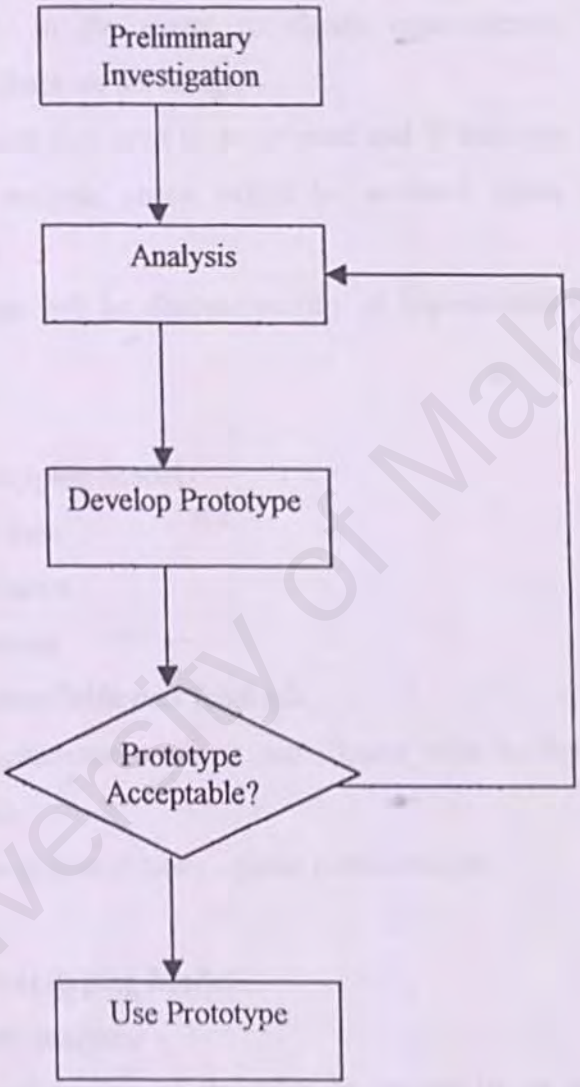


Figure 3.2 Prototyping Model

Figure 3.2 depicts the development of a prototype. As a start, after the project title is identified, preliminary investigation would be done. The activities include listing problems, opportunities, and directives, defining project objectives and scopes, and planning of the project.

Next, research and analysis would be done to seek all information related to the project title. These may include problem analysis, requirements analysis and decision analysis. From research and analysis made, a thorough literature review would be presented.

After the analysis phase, the first prototype would be developed. The prototype would be implemented only to the extent to clarify requirements, identify new requirements, and provide feedback on the design.

If there are requirements that need to be revised and if there are problems and faults identified, then, the analysis phase would be revisited again and thus the prototyping loop repeats itself.

Eventually, a prototype will be deemed worthy of implementation and thus, is placed into operation.

3.2.2.2 Advantages Of Prototyping Model

a) Reduces development time.
b) Reduces development costs.
c) Requires user involvement.
d) Developers receive quantifiable user feedback.
e) Facilitates system implementation since users know what to expect. Results in higher user satisfaction.
f) Exposes developers to potential future system enhancements.

3.2.2.3 Disadvantages Of Prototyping Model

a) Can lead to insufficient analysis.
b) Users expect the performance of the ultimate system to be the same as the prototype.
c) Developers can become too attached to their prototypes
d) Can cause systems to be left unfinished and/or implemented before they are ready.
e) Sometimes leads to incomplete documentation.

f) If sophisticated software prototypes (4th GL or CASE Tools) are employed, the time saving benefit of prototyping can be lost.

3.2.3 Comparisons Between Waterfall And Prototyping Methodologies

Table 3.1 Waterfall Vs. Prototyping

	Waterfall	Prototyping
1.	Forces analysis and planing before actions are taken.	Models final product and attributes testing of the final product even if it's not ready yet.
2.	ALL details must be defined up front.	Prototype models are tested and reviewed throughout development
3.	After final requirements are released, there is no room for correction.	An iterative process
4.	Emphasis on planning	Emphasis on users

3.2.4 Methodology for the Project

Due mainly to the time constraints and the nature of this system, the waterfall model is being used for this project. This method is chosen because it presents comprehensive steps on what happen during the development circle and it suggests to the developers the sequence of the event they should deal with. Other main reasons why it has been chosen are described below.

a) Ensure that developer building the right system according to the specification and verification checks the quality of the implementation.

b) Easy to associate and identify each milestones with its deliverer.

c) Enables developers to develop a more accurate system according to the user's discretion. This helps developers to learn about the system and gain better understanding of the entire system as it is developed.

d) This model is much more flexible. The development process can be easily verified and if there were any errors or additional aspects to add in into the phase before it, the development process can be reserved easily. This can reduce cost in error.

3.3 Techniques Used For Information Gathering

Information gathering is required to know what is needed in a system. A few of the fact-finding techniques as listed below are used to gather information related to the system that is going to be developed.

a) Documentary/Research
b) Internet Surfing
c) Interview and questionnaire

3.3.1 Documentary/Research

All the research work is approached from the view of this system, which involves reviewing academic materials that contain relevant information, especially on some existing technical work. Information is collected through reviewing reference books provided by course mates, library and bookshops. Examples of books that have been used are Palm Programming: The Developer's Guide and Palm How To Program.

Another resource is thesis reports from faculty document room, which helped in finding the suitable methodology for system development and analysis of similar system that has been developed by previous years students. Interactive Menu Selection system, developed by Wendy Jiliun is used for reference.

Furthermore, media such as newspapers and magazines have been a great help in finding information about involved technology for the proposed system such as wireless handheld and Palm OS. Those media consists of articles with latest updates and trend, which is progress locally and internationally. Table 3.2 is a table of the newspaper names, IT column names and respective publication days of the IT columns.

Table 3.2 Newspapers

NEWSPAPER	IT COLUMN	DAYS
The Star	In.Tech	Tuesday
New Straits Times	Computimes	Monday, Thursday

3.3.2 Internet Surfing

Surfing the Internet is indeed a good way of fact-finding information. Feedback from some Frequent Asked Question (FAQ) sessions and joining the e-commerce related newsgroups helped author to clear up misconceptions or erroneous plans that have been formed. Local and outbound existing similar systems could easily be found via world wide web, which help a lot in giving ideas and guidance or the features of the system that will be developed. Below is the list of some URL of the web sites that have been visited for information gathering.

a) www.ameranth.com
b) www.palmos.com
c) www.pcworld.com
d) www.ivoice.com
e) www.palmpower.com

Online discussion groups provide a great resource for finding answers to related issues questions. With a worldwide network of community members, these discussion groups provide all types of people that can answer questions that both the newbie and experienced Palm OS developer have.

3.3.3 Interview And Questionnaire

An information-gathering interview is a directed conversation with a specific purpose that uses a question-and-answer format. In the interview, the interviewer wants to get the opinions of the interviewee and his or her feeling about the current state of the system, organizational and the person goals, and informal procedures. Above all, seek the opinions of the person that are interviewing. Opinions may be more important and more revealing that facts.

Questionnaire is information-gathering technique that allows system analysts to study attitudes, beliefs, behaviors, and characteristic of several key people in the organization who may be affected by the current and proposed systems. Questionnaires may be used to determine how widespread or limited a sentiment expressed in an interview really is.

3.3.3.1 Analysis Of Interviews And Questionnaire Results

While gathering the information for this project, interviews were conducted together with the distribution of questionnaire over 25 respondents in Klang valley. The targeted respondents are restaurateurs that own a sit down, busy and with specific menu items restaurant. Interviews have been conducted via telephone call or visit the restaurant personally.

Statistical Result Of Currently Used Ordering Method

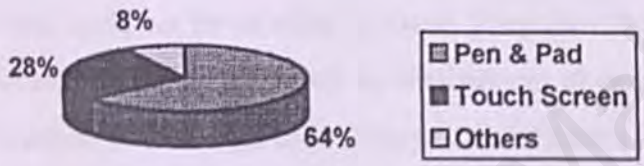


Figure 3.3 Percentage Of Each Ordering Method Used

Question two to question five of the questionnaire is to find out currently used ordering method in generally by the restaurateurs and the efficiency and problems encountered with each of the methods. Figure 3.3 reveals that majority of the restaurants with any capacity in Klang valley still remains faithful with the traditional pen and pad ordering method. Examples restaurants that use this method are Ciao at Jalan Tun Razak, A&V Lazar Chargrill Restaurant in KLCC and JW' California Grill.

Based on the collected data, restaurateurs that use pen and pad to take order have faced mostly with all the listed problems on question five, which are duplicate of order, incorrect taken order, repeating walking done by wait staff and slow of order sending to kitchen and cashier. This information together with the result of observing how the system works in the real restaurant environment has been used as the facts of problem definition of the proposed system, which stated earlier in Chapter 1.

Another 28 % of the respondents use touch screen to take order. Those restaurants are Villa Danieli, Sheraton Imperial Hotel, at Jalan Sultan Ismail, Le Vogue in

Renaissance Hotel, café in JW Marriot, Carmen's Seafood & Wine and few more. As can be seen where most of the restaurants that use this system are large-scale restaurant with capacity over 70 customers.

Restaurateurs that use touch screen ordering system said that the system could solve the major problems with the use of pen and pad method. The remaining 8 % of the respondents use wireless handheld ordering system and memorize order method. Based on the research, currently only restaurants in Star Cruise are using wireless handheld to take order.

Most of the restaurateurs that use pen and pad to take order said that they might need a better solution to replace the existing method, however cost to purchase the product is very high and could not be afforded by them. They also claimed that a whole POS system that included others functions such as management of employee, accounting and inventory control, which are not required for their restaurant means.

Awareness Of Wireless Handheld Order Taking System

Table 3.3 Results On Knowing About Wireless Handheld Order Taking System

Heard about wireless handheld order taking system	Total (/24)	Percentage (%)
Yes	3	12.5
No	21	87.5

This section analyses the results gathered from question 7 and question 8 of the questionnaire. As shown in Table 3.3, over 24 respondents that use ordering method other than wireless handheld order taking system, only three of them have heard about this system. Explanation has been given to those who are not aware with the existing of the system. Most of the respondents agree that the system could effectively solve the encountered problems and suitable for their restaurant. However same issue occurs regarding the high cost to purchase the system.

Analysis Of Currently Used Restaurant Reservation System

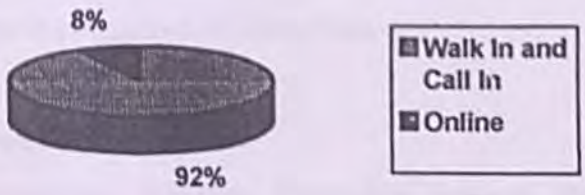


Figure 3.4 Percentage Of Each Restaurant Reservation System Used

This section focus on analysis of results gathered for question 9 to question 10 listed on the questionnaire. Figure 3.4 reveals that only two respondents are currently use online system for the reservation purpose. The relevant restaurant are T.G.I Friday's, The American Restaurant and Scalini's La Piccola Italia restaurant. The rest of the respondents are using traditional walk in or call in method for reservation.

These results may indicate that majority of the restaurateurs are still prefer to use traditional method rather then trying latest technology approach such as online reservation even the methods are not efficient enough. The reason behind is problems also occurred with the latest approach. Problems that have been pointed out by respondents are stated in Chapter 2, Literature Review.

Awareness Of IVR Applications In The Market

100 % of the respondents have heard or have used before IVR applications in the market such as TGV ticket booking IVR system and any other IVR help desk services provided by many international or big companies. This result shows that IVR applications are widely and commonly use in Malaysia, which indicates that these kinds of applications have a bright future and opportunities to be developed for others purpose.

The last question of the questionnaire is to gather respondents' opinion regarding the developing of IVR reservation system of the project, as a new approach to replace existing reservation methods. Most of the respondents are pleasant with the solution after listening the description of the proposed system.

3.4 System Requirements

A requirement is a feature of the system or a description of something the system must do in order to achieve the objectives of the system.

3.4.1 Functional Requirements

A functional requirement describes interaction between the system and its environment. Further, functional requirement also describes how the system shown behaves given a certain stimuli. The important thing is that the questions addressed by functional requirements have the answers that are independent of an implementation of a solution to the problem. The functional requirements for each subsystem are listed below:

Wireless Handheld Order Taking Subsystem

a) Allows wait staff login by using login name and password
b) Allows standard order taking
c) Allows specification of the table number - it is important that the wait staff can continue to specify these things, so their jobs are not made more difficult. It also aids the job of the "runner", and it allows smoother service in the restaurant.
d) Allows wait staff to preview the order list before submit the order
e) Allows wait staff to add new items or delete items from the order list

IVR Reservation Subsystem

a) Allows customer to reserve table via touch-tone replacement or direct dialogue
b) Allows customer to check restaurant daily promotion
c) System able to speak out a reference number to customer as reservation confirmation
d) System able to response for unacceptable reservation

Backend Monitoring Subsystem

a) Allows user to login
b) Allows user to view order status for each table – where they can view which order item has been settled or vice versa

c) Allows user to record outgoing ordered item

d) Allows user to keep track with and monitor reservation record

e) Allows user to generate daily popular ordered items analysis report

f) Allows user to edit menu items list

g) Allow user to edit recorder voice file for IVR reservation subsystem

3.4.2 Non Functional Requirements

Non-functional requirement are defined as constraints under which the system must operate and the standards, which must be met by the delivered system. The non-functional requirements for the proposed system are summarized as below:

a) User Friendly

The system must be considered as attractive and an easy-to-use application where the users will only have to tap on the buttons by using the stylus pen for handheld wireless order taking subsystem. This could be implemented by using menu driven hierarchical design to display the restaurant menu items. The backend monitoring system should display an error message if an error occurs, such as invalid data input, invalid password and so on. The system interface design should be consistent, attractive, user friendly and easily understood by any users For IVR reservation subsystem, steps involved to complete a task must not be too complicated, where users no need press a lot of buttons in order to make a reservation. Not much training is needed to use the system.

b) Efficiency

The system must be able to function in such a way that the respond time will be fast. The response time to retrieve the information such loading menu can be considered within a reasonable interval time. It means that all desirable information should be available to user at any point in time. The requirement for up-to-date information is also a necessary. Users should not be kept waiting for a long time for the system to respond. These could be implemented by defining a good database and the applying good programming codes.

c) Reliability

A system is said to have reliability if it runs undisrupted for a very long period of time without failure or crashing. The system must not produce dangerous or costly failures when it is used in a reasonable manner, that is in a manner that a typical user expects is normal, the proposed system has to be reliable to ensure the accuracy of order taking and reservation information.

d) Maintainability and expandability

Maintainability may be defined qualitatively as the ease with which software can be understood, corrected, adapted, or enhanced. Maintainability is the degree to which architectures, data, or procedural design can be extended. Database maintenance is a vital function for database system to ensure database integrity and availability. Another approach is backup database, where making a regular database is an important part of administrating a database system.

3.5 Run-Time Requirements

The run-time requirements are requirements that have to do with the hardware and software needs that must be fulfilled in order to maximize the performance of the system.

3.5.1 Development Hardware Requirements

a) IBM Compatible Computer
b) Intel Pentium II 400 MHz Processor
c) 192 MB SDRAM Memory
d) 26.4 GB of Hard Drive (Quantum Fireball)
e) Network interface card and hardware connection
f) Other standard computer peripherals
g) Palm OS handheld with Hotsync cradle

3.5.2 Development Software Requirements

a) Networking operating system - Microsoft Windows 2000 Server
b) Database – Microsoft SQL Server 7.0

c) Palm OS 4.0
d) CodeWarrior
e) Palm OS emulator
f) Parity software

3.5.3 Client Hardware Requirements

a) Pentium II 233 MHZ and above or AMD K6-2 300 MHZ and above At least 32 MB RAM
b) Network interface card and hardware connection with recommended bandwidth at 10 Mbps or more
c) Minimum 4.0 GB Hard Disk
d) Memory 32 MB RAM
e) Palm OS handheld
f) Infrared signal receiver
g) IVR card
h) 4-Port Voice Processing Boards
i) Other standard computer peripherals

3.5.4 Client Software Requirements

a) Palm OS 4.0
b) Microsoft Window 95, 98, NT, or 2000 operating system
c) Microsoft SQL Server 7.0

3.6 Tools Selected

3.6.1 Operating System

Microsoft Windows 2000 Server

SQL server 7.0 provides agility to the data management and analysis, allowing user's organization to adapt quickly and gracefully to derive competitive advantage in a fast changing environment. A complete database and data analysis package, SQL Server

7.0 opens the door to the rapid development of a new generation of enterprise-class business application that can give user's company a critical competitive advantage.

Microsoft SQL Server 7.0 was selected because of the reasons below:

a) The software is available at FSKTM
b) Provides extensive database programming capabilities built on Web standard.
c) Highly scalable and reliable
d) Users can build end-to-end analysis solutions with integrated tools to create value from data.
e) Users can visually design and code database applications from any Visual Studio tool. It is easy to manage databases centrally alongside all enterprise resources.

3.6.2 Palm OS Application Development Tool

AppForge 2.0

AppForge™ software offers the fastest way to create applications for PDAs, phones, barcode scanners and other Palm OS® devices. The software integrates into Microsoft® Visual Basic® 6.0 to give user the power of turning ideas into finished products in record time.

3.6.3 IVR Application Development Tool

Parity Software

The Parity software lines of toolkits have evolved into the Computer Telephony (CT) Application Development Environment (ADE). The CT ADE Version 8 enables users to easily develop applications using the equally robust functionality of the Graphical VOS or the CallSuite ActiveX programming environments. The details of the software are described in Chapter 2. The reasons why this tool was selected are listed below:

a) Availability of the software
b) It is designed and tested for Windows NT and Windows 2000
c) CallSuite ActiveX controls incorporate directly into Windows visual programming environments such as Visual Basic to provide telephony functions

3.6.4 Programming Language

Visual Basic has been chosen for the development of the system.

3.6.5 Database

Microsoft SQL Server 7.0

SQL server 7.0 provides agility to the data management and analysis, allowing user's organization to adapt quickly and gracefully to derive competitive advantage in a fast changing environment. A complete database and data analysis package, SQL Server 7.0 opens the door to the rapid development of a new generation of enterprise-class business application that can give user's company a critical competitive advantage.

Microsoft SQL Server 7.0 was selected because:

a) Provides extensive database programming capabilities built on Web standard.
b) Highly scalable and reliable
c) Users can build end-to-end analysis solutions with integrated tools to create value from data.
d) Users can visually design and code database applications from any Visual Studio tool.
e) It is easy to manage databases centrally alongside all enterprise resources.
f) Stay online while easily moving and copying databases across and computers or between instances.

3.7 Summary

In this part of the report, the system methodology has been discussed in detail, system requirements has been identified, as well as tools for the project has been selected.

Chapter 4: System Design

Chapter 4: System Design

4.1 Introduction

System design is a process to convert the conceptual ideas from requirement specification in system analysis into more technical specification.

In system design phase, the system requirements gathered during the analysis phase and research conducted earlier where transmitted into a representation of system. Initially, the representation depicts a holistic view of system; subsequently refinement reads to a design representation that is close to source code. In this system design phase, input, output, file and database were produced which include the designed of input forms, screen in order to gather input data, data dictionary, file specification and report design. [Jeffrey, 2000] The objectives of system design are listed below:

a) Specify Logical Design Elements

   Detailed design specifications that describe the features of information system: input, output, files and database and procedures.

b) Meet User Requirements

   Meet user needs stated in terms of:

   i. Performing appropriate form of information
   ii. Presenting proper form of information
   iii. Providing accurate results
   iv. Using appropriate method of interaction
   v. Providing overall reliability

c) Ease Of Use

   i. Favorable human engineering
   ii. Ergonomic design that is physically comfortable to user effectiveness and efficiency.

d) Provide Software Specifications

   Specific components and functions with adequate details are needed to construct application software.

4.2 System Functionality Design

System functionality design is based on the system requirements stated in Chapter 3. It translates the system requirements into system functionality. This design focuses on the system structure design and data flow diagrams.

4.2.1 System Structure Chart

The system structure is used to depict high-level abstraction of a specified system. The use of structure chart is to describe the interaction between independent modules. Major functions form the initial component part of the structure chart, which can be broken into detailed sub-components. Restaurant Ordering And Reservation System consists of three subsystems or sections: Wireless Handheld Order Taking, IVR Reservation and Backend Monitoring. Each of the three components is further divided into many modules.

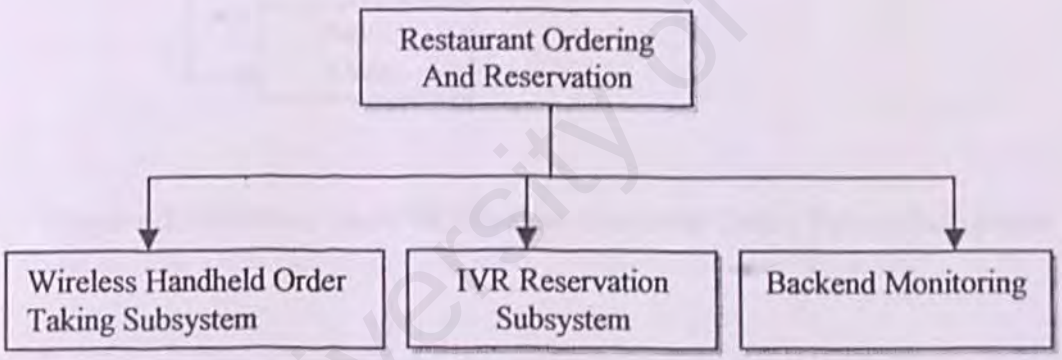


Figure 4.1 Structure Chart Of Restaurant Ordering And Reservation System

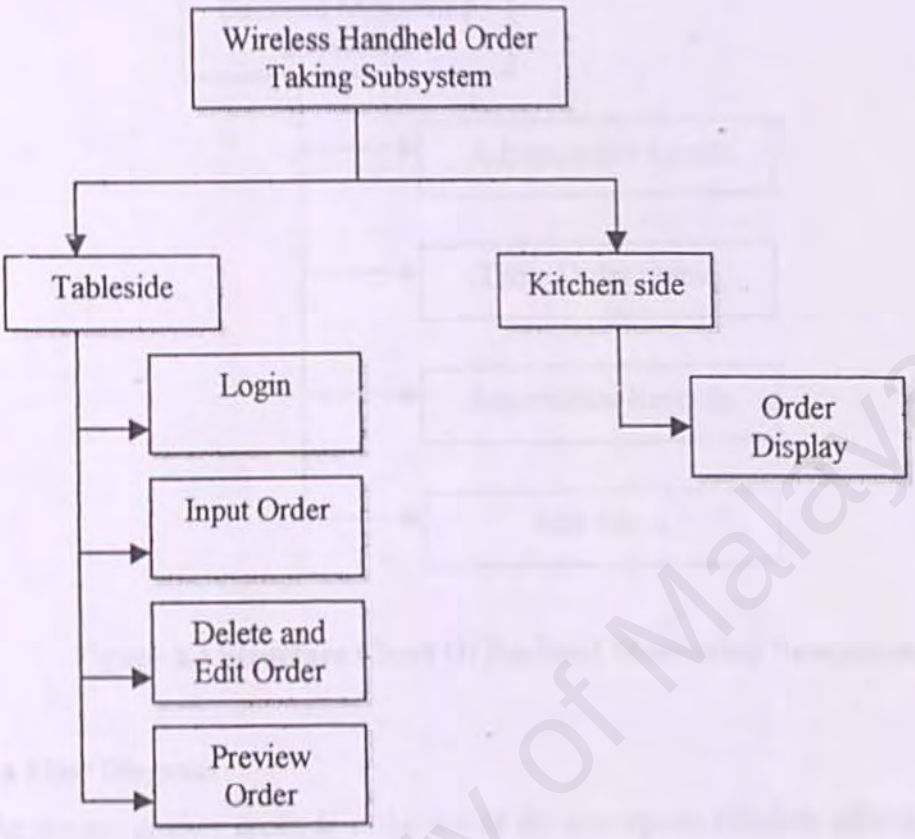


Figure 4.2 Structure Chart Of Wireless Handheld Order Taking Subsystem

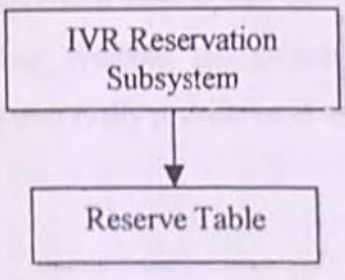


Figure 4.3 Structure Chart Of IVR Reservation Subsystem

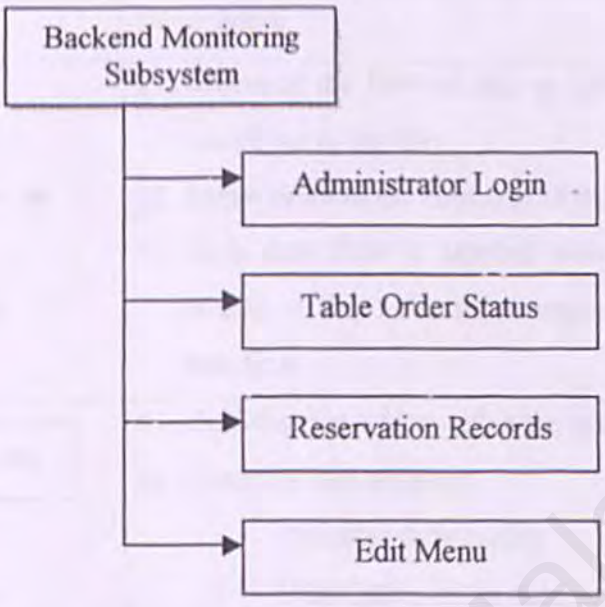
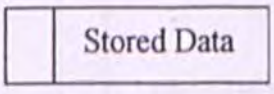
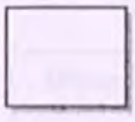


Figure 4.4 Structure Chart Of Backend Monitoring Subsystem

4.2.2 Data Flow Diagram

The system analyst needs to make use of the conceptual freedom afforded by the data flow diagrams (DFD), which graphically characterize data processes and flows in a business system. A series of layered data flow diagrams may also be used to represent and analyze detailed procedures within the larger system. Through DFD, the system analyst can put together a graphical representation of data processes throughout the organization. The data flow approach emphasizes the logic underlying the system. By using combination of only four symbols, the system analyst can create a pictorial depiction of processes that will eventually provide solid system documentation.

Table 4.1: The Four Basic Symbols Used In Data Flow Diagram

Symbol	Description
 Data Flow	a) Represent the flow of data or information from one object to another. b) Arrow denoted the direction of data flow. c) Each data flow is labeled with the name or details of the information represented by the data flow
 Data Store	a) Hold data for a time within the system b) Comprise two sections: i. Identifier information ii. Description of the data stored
 Entity	a) Any objects in the real world, for example person.
	a) Transform the input data to output data b) Represented by rectangle shape c) Comprise 2 or 3 sections: i. Top section contains the identifier information ii. Center section contains a description of the process iii. Lower section contains the physical or computer program information

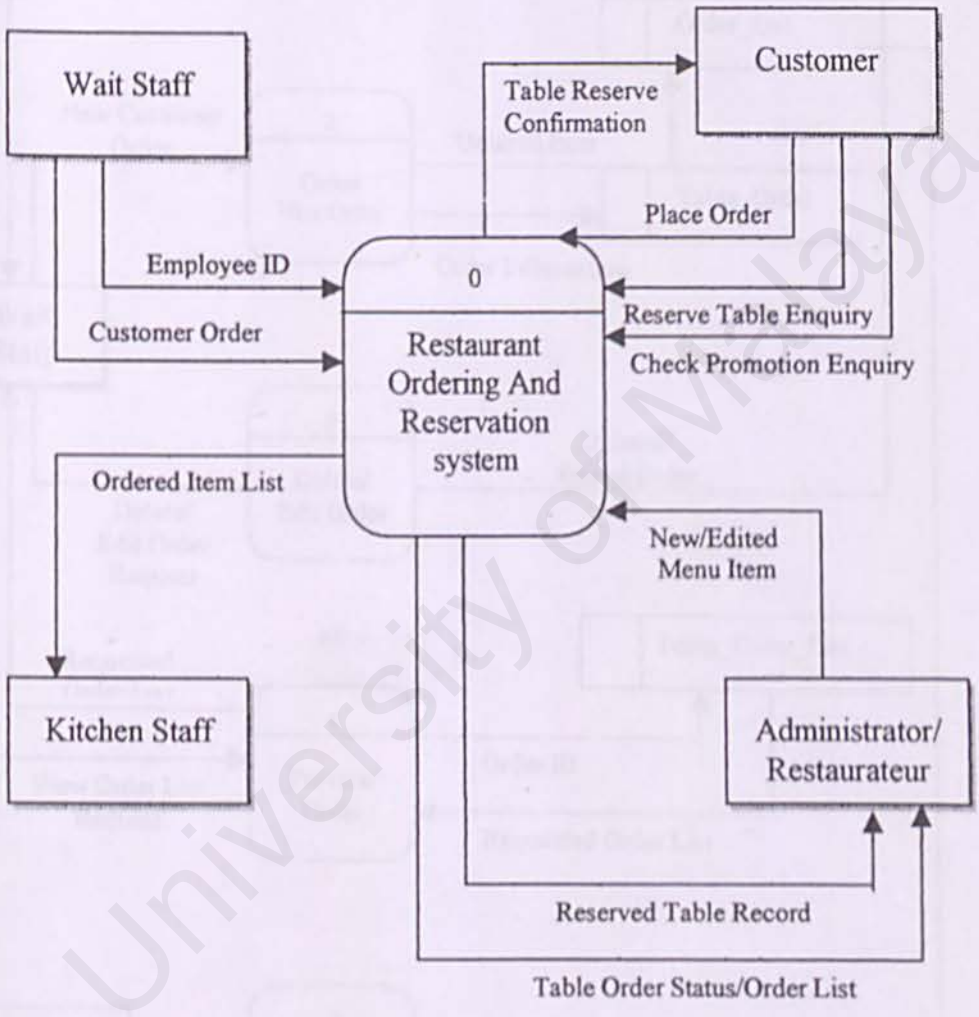


Figure 4.5 Context Data Flow Diagram

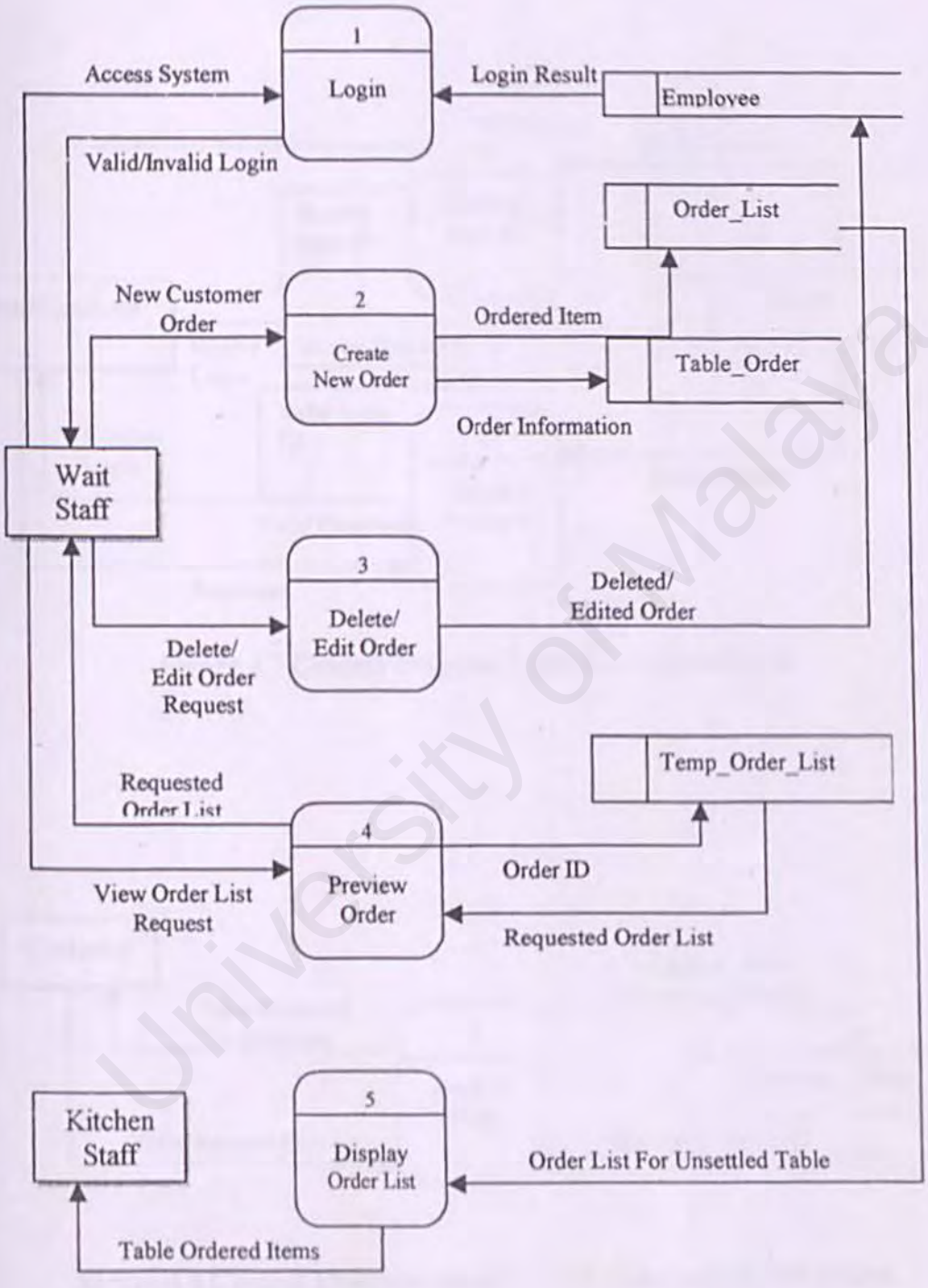


Figure 4.6 Context Diagram Level 0 - Wireless Handheld Order Taking

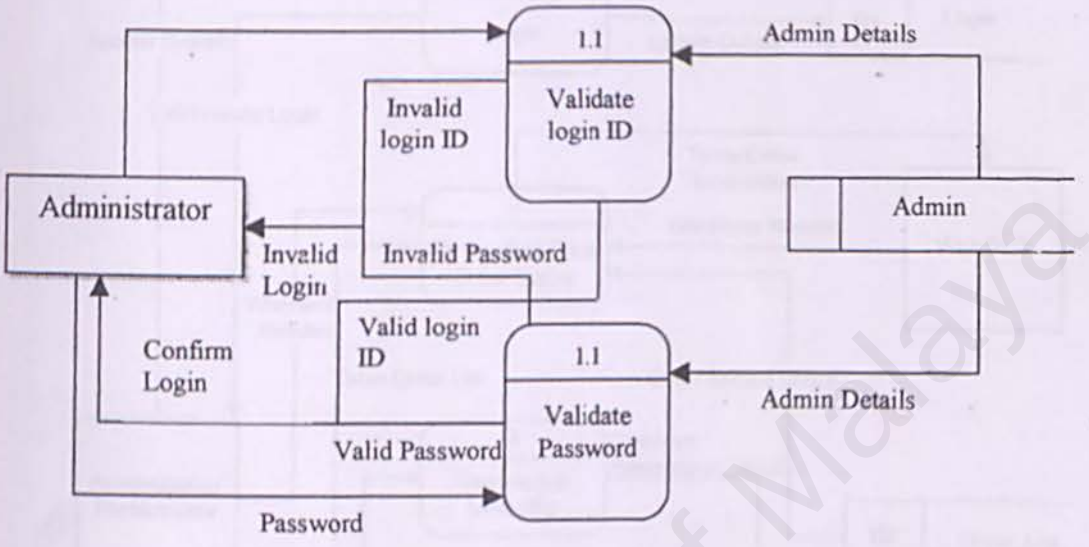


Figure 4.7 Context Diagram Level 1 – Login Module

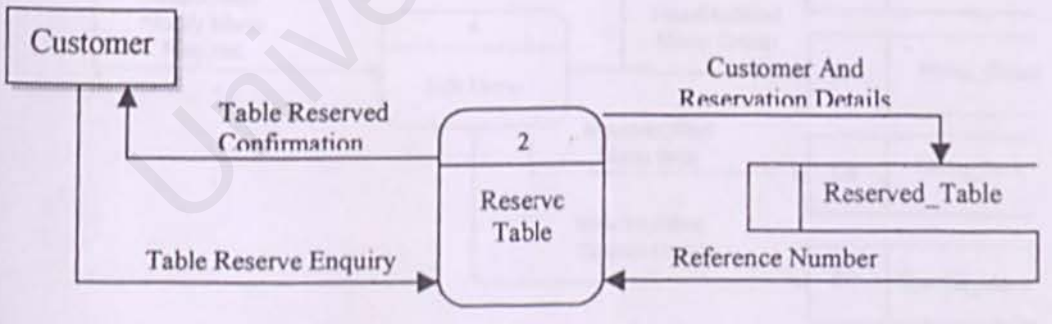


Figure 4.8 Context Diagram Level 0 – IVR Reservation Subsystem

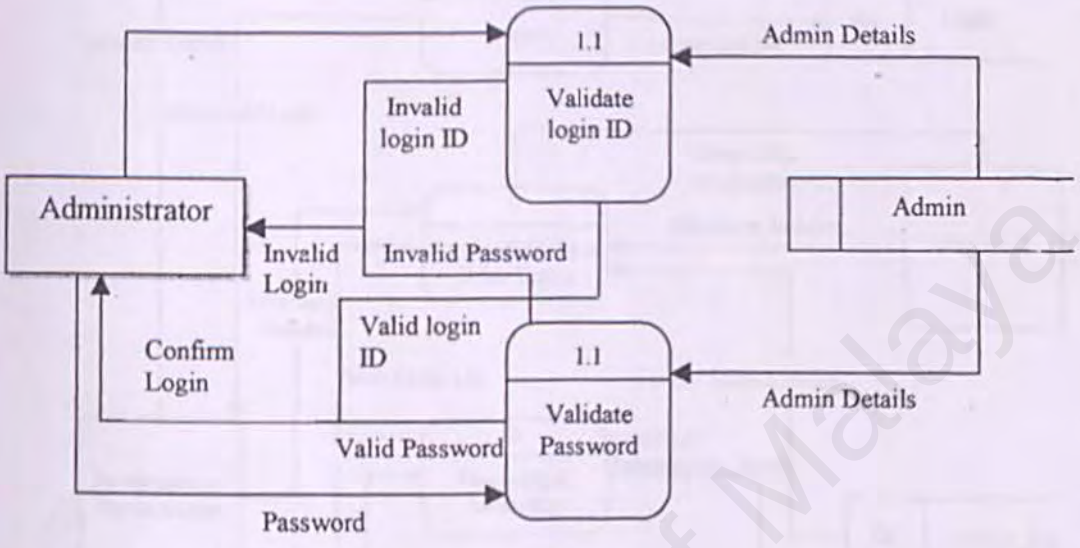


Figure 4.7 Context Diagram Level 1 – Login Module

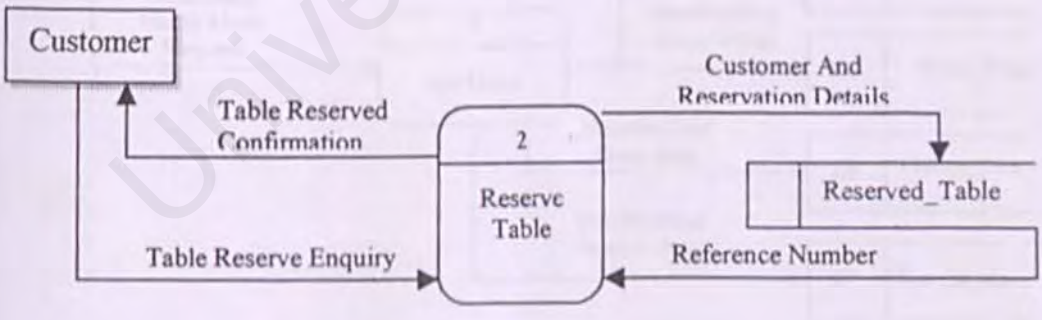


Figure 4.8 Context Diagram Level 0 – IVR Reservation Subsystem

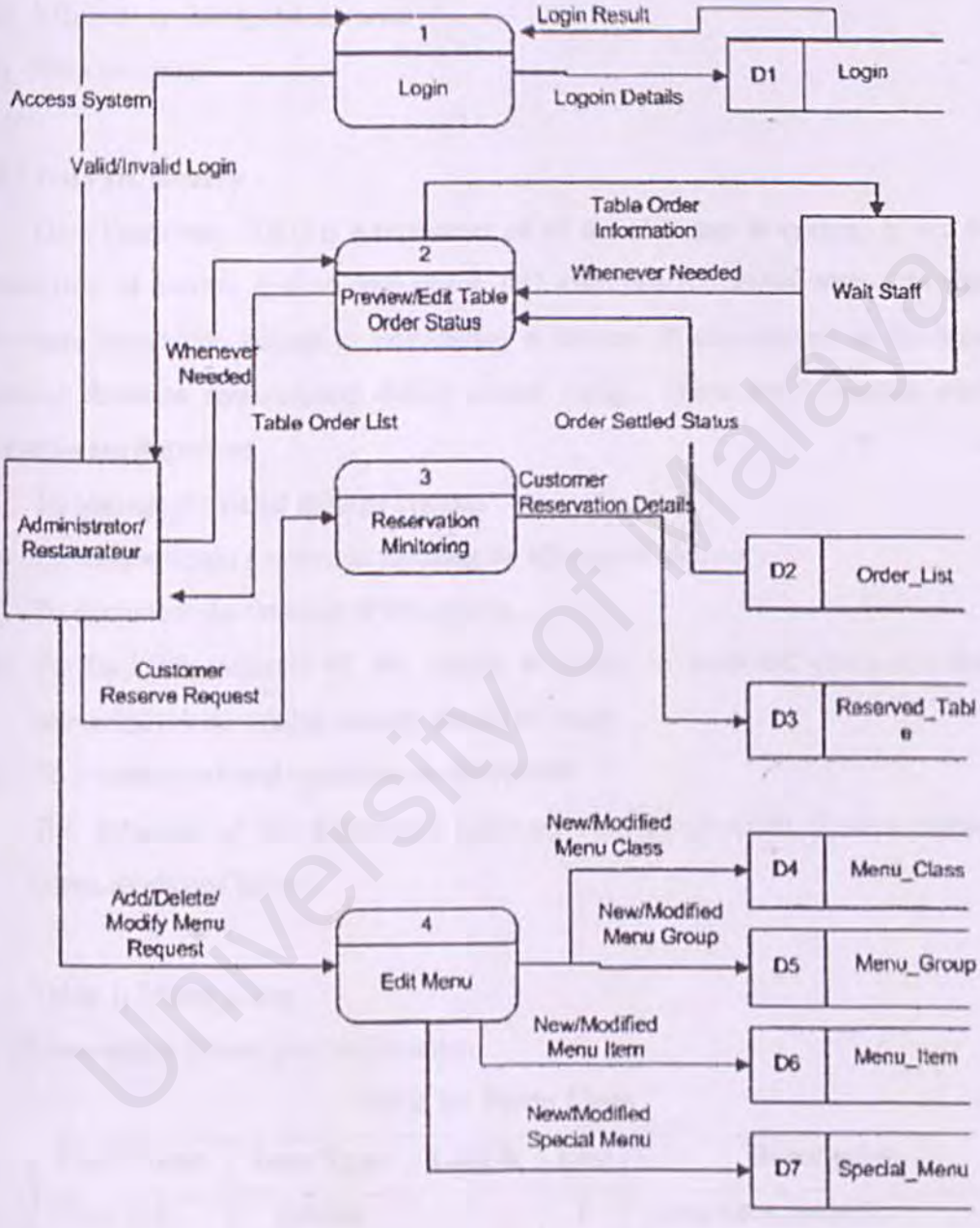


Figure 4.9 Context Diagram Level 0 –Backend Monitoring Subsystem

4.2.3 Database Design

The relational database model is used in database implementation for ORRS. The database is constructed using the Microsoft SQL Server 7.0. The design objectives are:

a) Purposeful information retrieval
b) Efficient Data Storage
c) Data Availability
d) Efficient updating and retrieval
e) Data integrity

4.2.3.1 Data Dictionary

Data Dictionary (DD) is a repository of all the elements in system. It is a logical characteristic of current system data stores. DD identifies processes where the data are need where immediate access to information is needed. It also serves as the basic for identifying database requirements during system design. There are 5 reasons why data dictionaries are important.

a) To manage the detail in large systems
b) To communicate a common meaning for all system elements
c) To document the features of the system
d) To facilitate analysis of the details in order to evaluate characteristics and determine where system change should be made
e) To locate errors and omissions in the system

The database of the Restaurant Ordering And Reservation System consists of tables as shown below.

Table 1: Menu_Class
Description: Menu class information

Table 4.2 Menu Class

Field Name	Data Type	Length	Key	Description
Class_ID	varchar	5	1	Menu class identifier
Class_Name	varchar	15		Class name that appear on menu list
Class_Desc	varchar	200		Menu class description

Table 2: Menu_Group

Description: Menu group information

Table 4.3 Menu Group

Field Name	Data Type	Length	Key	Description
Group_ID	varchar	5	1	Menu class identifier
Class_ID	varchar	5		Foreign key from Class_Menu table
Group_Name	varchar	15		Item name that appear on menu list
Group_Desc	varchar	200		Menu class description

Table 3: Menu_Item

Description: Menu item information

Table 4.4 Menu Item

Field Name	Data Type	Length	Key	Description
Item_ID	varchar	5	1	Menu item identifier
Group_ID	varchar	5		Foreign key from t Group_Menu table
Item_Name	varchar	15		Item name that appear on menu list
Item_Desc	varchar	200		Menu item description
Price	numeric	3		Price of the menu item

Table 4: Special_Menu

Description: Special menu offered by the restaurant such as special dinner set

Table 4.5 Special Menu

Field Name	Data Type	Length	Key	Description
Special_ID	varchar	5	1	Special menu class identifier
Special_Name	varchar	15		Name that appear on menu list
Special_Desc	varchar	200		Description of special menu
Price	numeric	3		Price of the special menu

Table 5: Table_Order

Description: Order information of each table in the restaurant

Table 4.6 Table Order

Field Name	Data Type	Length	Key	Description
Order_ID	varchar	5	1	Identifier of each table order
Table_ID	varchar	5		Number ID given to each table
Time_In	datetime	8		Time when order being taken
Time_Out	datetime	8		Time when bill is paid
Total	numeric	9		Amount that has to be paid
Paid	char	1		Bill paid status
No_Customer	int	4		Number of customer for each table
Employe_ID	varchar	5		Identifier of wait staff

Table 6: Order_List

Description: Ordered items of each table

Table 4.7 Order List

Field Name	Data Type	Length	Key	Description
Order_ID	varchar	5	1	Identifier of each table order, as well the bill number
Ordered_Item	varchar	15		Item that ordered by customer
Settled	char	1		Item settle state

Table 7: Employee

Description: Wait staff particulars

Table 4.8 Employee

Field Name	Data Type	Length	Key	Description
Employee_ID	varchar	5	1	Identifier number of wait staff
Password	varchar	10		Login password to access system
First_Name	varchar	50		Wait staff first name
Last_Name	varchar	50		Wait staff last name

Table 8: Reserved_Table

Description: Reservation information

Table 4.9 Reserved Table

Field Name	Data Type	Length	Key	Description
Reserve_ID	varchar	5	1	Reservation identifier
Date	datetime	8		Desired visiting date

Time	datetime	8		Desired visiting time
No_Customer	integer	4		Number of customers to be reserved
Reference_No	numeric	5		Number that given to the caller
Contact_No	varchar	12		Customer contact number

Table 9: Promotion

Description: Daily promotion or special meal offer by the restaurant

Table 4.10 Promotion

Field Name	Data Type	Length	Key	Description
Promotion_ID	varchar	5	1	Promotion identifier
Description	varchar	8		Description of the promotion
Price	numeric	3		Price of the promotion
File_Address	varchar	10		File name/address of the voice file that resides in the server hard disk

Table 10: Login

Description: Administrator/ Authorized person login details

Table 4.11 Login

Field Name	Data Type	Length	Key	Description
Login_ID	varchar	10	1	Login ID
Password	varchar	10		Login password to access system

4.2.4 User Interface Design

The Human Computer Interface (HCI), commonly called the user-interface is doorway into an interactive software application. The interface is the system for most users. However poorly designed, it stands as the representation of the system. The interface must help users and business get the information they need in and out of the system by addressing the following objectives:

a) Effectiveness as achieved through the data of interfaces that allow users to access the system in a way that is congruent with their individual needs.
b) Efficiency as demonstrated through interfaces that both increase the speed of date entry and reduce errors.
c) User consideration as demonstrated in the description of suitable interfaces and by providing appropriate feedback to users from the system.
d) Productivity as measured by ergonomically sound of design for user interfaces and workspaces.

For the proposed system, designing of graphical interfaces is only done for wireless handheld order taking and backend monitoring subsystem. The following are some of the consideration taken while designing the user interface of the system:

a) Be consistent, which means use a consistent format for menu selection and data display. Use of consistent label, standard abbreviation is also necessary
b) Offer meaningful feedback such as display appropriate error message when the user has done or key in something wrongly.
c) Reduce the command that must be memorized in order to carry out any operations
d) Combo boxes will be used instead of text boxes to minimize any complex logic operations.

Below are a few examples of the system interface draft.

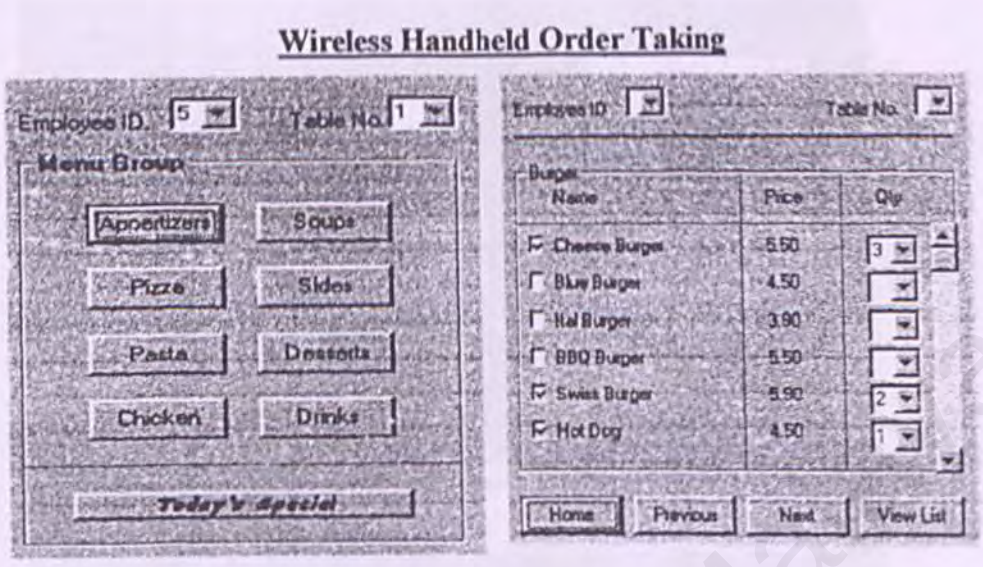


Figure 4.10 Menu Group Layout **Figure 4.11 Order Input Form Layout**

Figure 4.10 above is the draft of menu group interface, which will be displayed on the handheld. User could tap on the selected menu group button, such as chicken in this case, which will then be redirected to specific menu items input form, as shown in figure 4.11.

Backend Monitoring

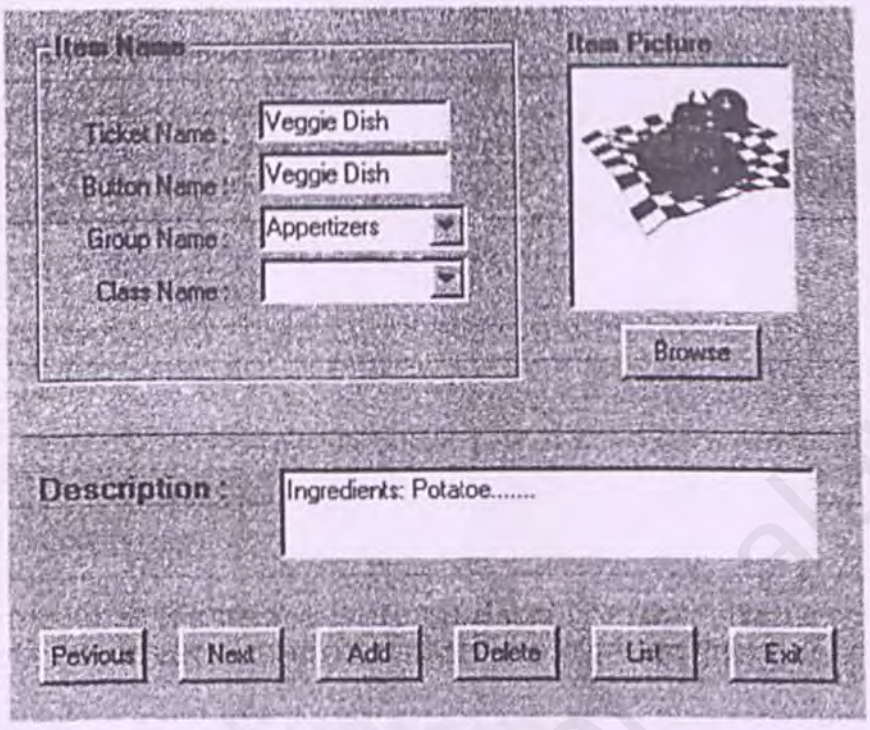


Figure 4.12 Edit Menu Layout

Figure 4.12 is the layout of menu editing interface of the backend monitoring subsystem. This is the interface where user could add, delete and preview menu item.

4.3 Summary

System design is important to be taken into account before any implementation is done, in order to get the overall system flows and to show clearly the ideas on how a system is to be developed.

Chapter 5: System Implementation

Chapter 5: System Implementation

5.1 Introduction

System implementation is a process to convert the system requirements into program codes. This phase also describes how the initial and revises process design put into the real work. Therefore, system implementation involved the translation of the software representation produces by the design into a computer understandable form.

5.2 Development Environment

The initial stage of system implementation involves setting up the development environment. Development environment has certain impact on the development of a system. Using the suitable hardware and software will not only help to speed up the system development but also determine the success of the project. The hardware and software tools used to develop the entire system is as discuss below:

5.2.1 Hardware Configuration

The following hardware specifications have been used to develop the system:

a) 500 MHZ AMD Processor
b) 128 SDRAM
c) 10 GB Hard Disk
d) Other standard desktop PC component
e) Palm III C
f) Telephone
g) IVR card

5.2.2 Software Configuration

There are a lot of software tools, which are used in designing and writing report. The design process involves the drawing and design of graphics, structure chart, data flow diagram and other foundation implementations of the software development. The

purpose of this graphically logical design is to provide an overall view of system and interconnection between the modules.

Table 5.1 below shows the type of software used throughout the development process as pertaining too the specific usage:

Table 5.1 List of the software tool used for development

Software	Usage	Description
Windows 98	System Requirement	Operating System (OS)
Parity Software	System Requirement	Coding the IVR reservation subsystem
AppForge 2.0 Combo Pack	System Requirement	Coding the wireless order taking subsystem
Microsoft Visual Basic 6.0	System Requirement	Coding the backend monitoring subsystem
Microsoft SQL 7.0	Database	Database design, Construction and implementation for data storage and manipulation

5.3 System Development Strategy

The design must be translated into the form that can be understood by the machine. The code generation step performs this task. Restaurant Handheld Ordering & Reservation System is accomplished with the well and detailed design and coding. System development consists of the following 5 steps.

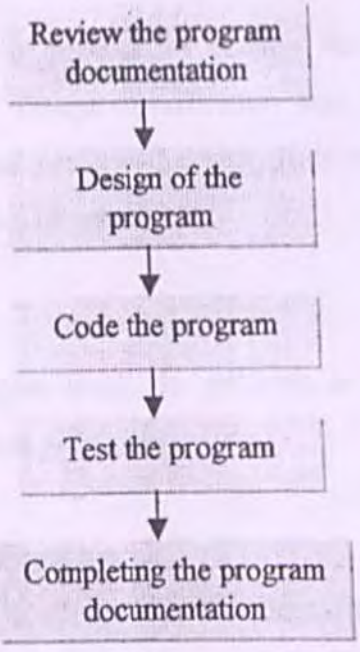


Figure 5.1 System Development

5.3.1 System Development's Process

5.3.1.1 Review The Product Documentation

Review the product documentation that was prepared during the previous phases. The program documentation catalogue system consists of simple process check, report layout, data dictionary entries and the source documentation. This documentation has the author to understand better of the work that need to be covered during this coding phase.

5.3.1.2 Design The Program

After the program documentation review, the second level of program design needs to be completed during the system development. For this second level of program design, exactly what the program can accomplish is decided. This is the process of what it must do by developing a logical solution to the programming problem. The logical solution or logic for a program is a step-by-step solution to a programming problem.

5.3.1.3 Code The Program

Coding the program is a process of writing the program instruction that implements the program design. Design specification must be translated to machine-readable format. The coding steps perform this task. If design is performed in detailed manner, coding can be accomplished mechanically.

5.3.1.4 Test The Program

During the testing program level, the program is processes actual data and produces information on which user will be relying on.

5.3.1.5 Documentation Of The Program

Completing the program is essential for the successful operation and maintenance of the information system. This documentation includes the system's user manual that may be needed by most of the customer as well as the system administrator.

5.3.2 Program Coding

During this phase, the programs are written and user interfaces are developed and database is initialized with data. The design must be translated into a machine-readable form. The coding step performs this task. If design is performed in a detailed manner, coding can be accomplished mechanistically. During coding, the components built during development are put into operational use. The system is built according to the original design that was done.

5.3.2.1 Coding Approach

The coding approach used in the development of this system is the top-down and bottom-up approach. By combining with approaches at different stages of coding, testing could be done on these completed modules while others are still being coded.

Top-down approach

This approach allows the higher-level modules to be coded first before the lower-level modules. The codes in the lower modules contain only an entry and an exit. A

module with such characteristics is called a shell. The higher-level modules will reference the lower ones if they are coded and available. Reference to a shell will result in an empty action.

This approach will ensure that the most important modules will be developed and tested first. It also gives a preliminary version of the system sooner.

Bottom-up approach

Oppose to the top-down approach, the bottom-up approach begins with the coding of the lower-level modules first before the higher-level modules. However, the higher modules are just skeletons that call the lower modules. This approaches is used if the critically of lower level modules is high and need to be completed first.

5.3.2.2 Coding Style

Coding style is an important attribute of source code and it determines the intelligibility of a program. An easy to read source code makes the system easier to maintain and enhance. The element of coding style includes internal (source code level) documentation, method of data declaration and approach to statement construction.

The following lists some of the styles used during coding styles:

i) Code each variable so that it corresponds as closely as possible to a verbal description of the substantive hypothesis the variable will be used to test.
ii) Errors in code should be corrected when they occur and the code rerun.
iii) Each program should perform only one task.
iv) Each section of a program should perform only 1 task.
v) Use a consistent style regarding lower and upper case letters.
vi) Use variable names that have substantive meaning
vii) Use appropriate white space in your program in a consistent fashion that marks them easy to read
viii) Include comments before each block of code describing the purpose of the code.
ix) Include comments for any line of code if the meaning of the line will not be unambiguous.

x) Verify that missing data is handled correctly on only recode or creation of a new variable.

5.3.2.3 Coding Documentation

Code documentation begin with the selection of identifier (variable and variable) names, continues with the composition of connectivity and end with the organization of the program. Use blank line or indentation so that comment can be readily distinguished from code.

I. Internal Documentation

The Internal documentation contains information directed at someone who will be reading the source code of the programs. It is important for a clearer understanding.

Internal comment provides a clear during the maintenance phase of the system. Comments also provide the developer with means of communication with readers of the source code. Statement of purposes indicating the function of the module and descriptive comment that is embedded within the body of the source code is needed to describe processing function.

II. Naming Convention

Naming convention provides easy identification for the programmer. The naming convention is created with coding consistency and standardization in mind.

III. Modularity

In order to reduce complexity, facilitate changes result in easier implementation by encouraging parallel development of different part of a system. It is measured using two qualitative criteria – cohesion and coupling. Software with effective modularity is easier to develop because function may be compartmentalized and interfaces are simplffied. Independent modules are easier to maintain because secondary effects caused by design or code modification are limited, error propagation is reduced, and reusable modules are possible.

5.4 Development of Restaurant Ordering & Reservation System

5.4.1 System Coding

As mentioned in the previous chapter, the programming tool that used to implement Restaurant Ordering & Reservation System is Visual Basic 6.0. There are a few advantages of using Visual Basic as compared to other programming languages. Visual Basic is a visual and events driven Programming Language. These are the main divergence from the old BASIC. In BASIC, programming is done in a text-only environment and the program is executed sequentially. In VISUAL BASIC, programming is done in a graphical environment. Because users may click on a certain object randomly, so each object has to be programmed independently to be able to response to those actions (events). Therefore, a VISUAL BASIC Program is made up of many subprograms, each has its own program codes, and each can be executed independently and at the same time each can be linked together in one way or another.

Below is a Visual Basic code example taken from the project.

```
With deFrontEnd2
If .rscmdTimeIn.State = 0 Then
.rscmdTimeIn.Open
End If

If Not .rscmdTimeIn.EOF Then
.rscmdTimeIn.MoveFirst
firstTable = .rscmdTimeIn("TableID")

End If
For i = 0 To 3
If Not .rscmdTimeIn.EOF Then
adoTable1.Item(i).RecordSource = "SELECT ItemName, Quantity " & _
"FROM OrderedItems INNER JOIN Item ON OrderedItems.ItemID = _
Item.ItemID " & _
"WHERE Settled = False AND TableID =" & .rscmdTimeIn("TableID")
adoTable1.Item(i).Refresh
lblTimeIn(i) = "Time In: " & .rscmdTimeIn("TimeIn")
lblTable(i) = "Table: " & .rscmdTimeIn("TableID")
If .rscmdTimeIn.State = 0 Then
.rscmdTimeIn.Open
End If
.rscmdTimeIn.MoveNext
Else
intCurTable = i + 1
Exit For
End If
Next i
End With
```

Figure 5.2: Sample Code Taken From The Project

5.4.2 Database Connection-Data Manipulation Using ADO Object

In Restaurant Ordering & Reservation System, all the related database tables will be created using Microsoft SQL Server 7.0. ActiveX Data Objects (ADO) is an easy-to-use yet extensible technology for adding databases access to Visual Basic application. The first step in creating a Visual Basic application is to provide a way for ADO to locate and identify your data source. This is accomplished by means of a connection string. ADO uses the connection string to identify the OLE-DB provider and to direct the provider to the data source. The provider is a component that represents the data source and express information to your application in the form of row sets. To establish a database connection, you first create an instance of the connection object. After open the connection, we have to open the "Recordset" to retrieve the relevant data from the database. As its name implies, the Recordset object has features that you can use, depending on your query constraints, for retrieving and displaying a set of database rows or records. The Recordset object maintains the position of each record returned by a query, thus enabling you to step through results one item at a time.

Figure 5.3 shows example code of Recordest Object taken from the project.

```
Global Const gcnnStr = "Provider=Microsoft.Jet.OLEDB.4.0;Data
Source=C:\Restaurant\Restaurant.mdb;Persist Security Info=False"
Dim rstUpdatePaid As New ADODB.Recordset
Dim qUpdatePaid As String

qUpdatePaid = "UPDATE OrderList Set Paid = True Where TableID =" &_
adoOrderedItems.Recordset("TableID")
rstUpdatePaid.Open qUpdatePaid, gcnnStr
```

Figure 5.3 Recordset Object

5.4.3 Using Datagrid Control To Display Data – Visual Basic

There are many Visual Basic Objects used in the development of this project. One of those objects is Data Grid control. Datagrid control is a spreadsheet like bound control that display a series of rows and columns representing records and fields from a Recordset object. You can use the Datagrid to create an application that allows the end user to read and write to most databases. The Datagrid control can be quickly configured at design time with little or no code. When you set the Datagrid control's DataSource

Property at design time, the control is automatically filled and its column headers are automatically set from the data source's recordset. You can then edit the grid's columns; delete, rearrange, add column headers to or adjust any column's width.

At run time, the DataSource can be programmatically switched to view a different table or you can modify the query of the current database to return a different set of records here.

5.5 Summary

This chapter describes the implementation of the system being developed. It begins with the introduction to systems implementation and later discusses the phases involved in implementing the system. It is then followed by the discussion on the system coding. In system coding, the coding conventions and Visual Basic code modules were elaborated. System testing will be discussed in the next chapter.

Chapter 6: System Testing

Chapter 6: System Testing

6.1 Introduction

This chapter describes the module and method of system testing. The purpose of doing testing is to make sure that the entire system does not have any system bugs and error.

Several rules serve well as program testing objectives.

a) Testing is a process of program execution with explicit intents to find errors and run – time program bugs.

b) An effective test case is one that contains unexpected testing record sets with high probability of detecting undiscovered errors during the program design and development phases.

A successful test is also not one that uncovers only few expected error, it is which constantly provides new challenges to its programmers over time.

6.2 Testing Process

In general, the testing process of this system can be shown in the following figure:

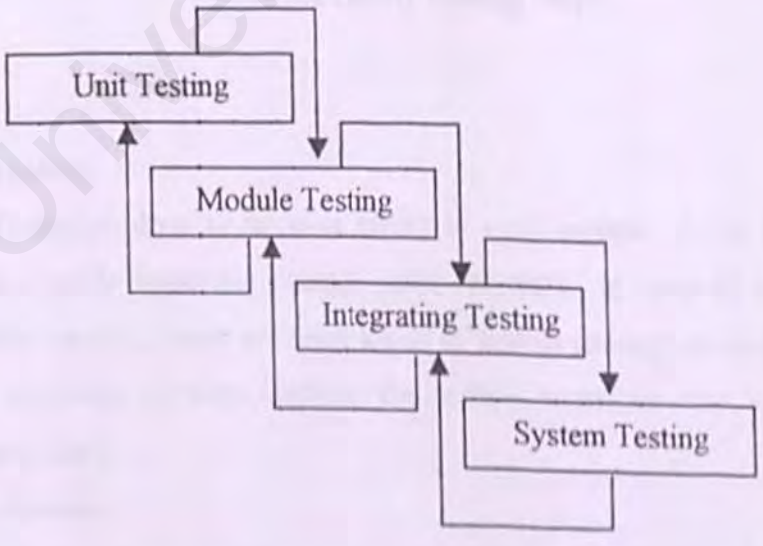


Figure 6.1 Testing Stages

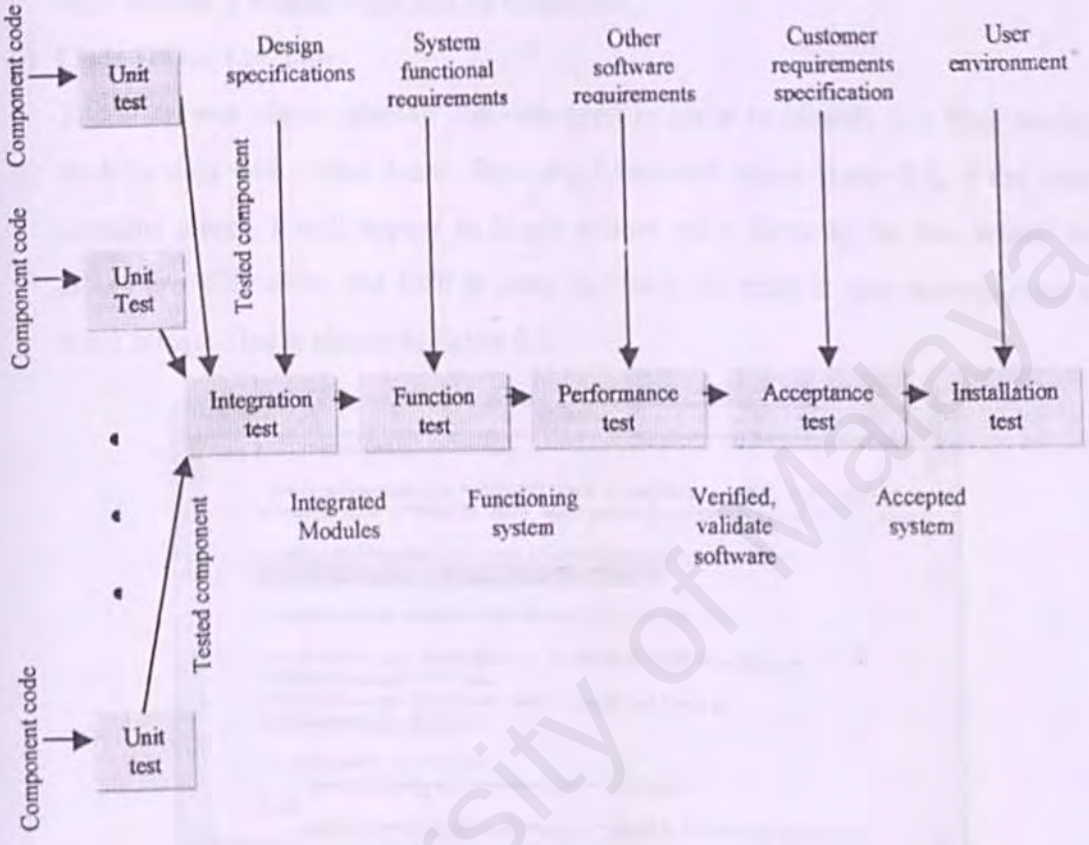


Figure 6.2 Detail Testing Steps

6.2.1 Unit Testing

Unit Testing is done to uncover errors in each module. Using the detail design description as a guide important control paths are tested to uncover errors within the boundary of the module. There are three kinds of testing strategy carried out for the unit testing. The following sections explain the testing strategies that were carried out throughout the project.

a) Code Review

The codes are examined line by line in order to make sure that many uncovered semantic errors during implementation could be revealed. In reviewing the code,

the correctness of coding was identified by comparing it to the original design of the program flow. When the logic and flow of the program were identified, the code was commented so that it can be traced in the future. There are two types of code review: a walkthrough and an inspection.

b) Code Differ In Color

The code was also examined and debugged in order to identify any fault coding such as data and syntax faults. By using Microsoft visual Basic 6.0, if the code contains errors, it will appear in bright yellow color showing the line where the errors are. Therefore, the built in color differing the code is very convenience to trace errors. This is shown in figure 6.2.

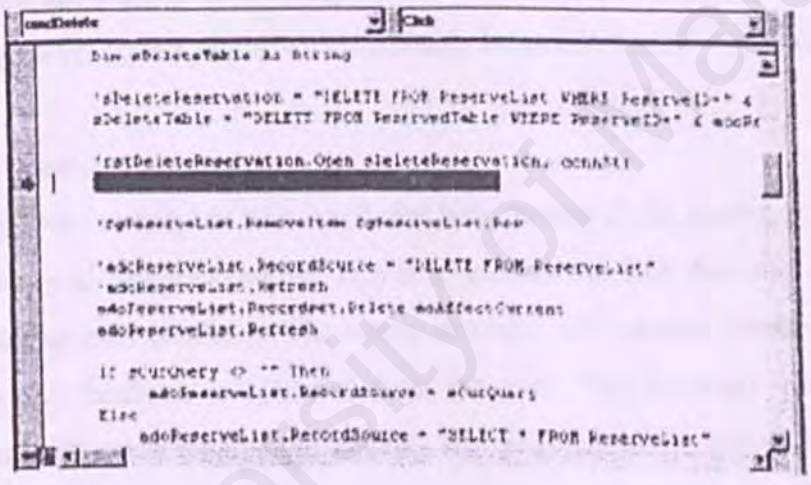


Figure 6.3 Showed Color Represent Code Errors

c) Test Cases

After reviewing the codes, test cases are developed to show that the input is properly converted to the desired output. This approach is used as some set of structural input is given and output is observed. This strategy is needed to identify the variance between the prototype and the requirement. In this testing, we input different set of data to the program. To test a component, choose input data and conditions, allow the component to manipulate the data, and observe the output . For example to test the logon module, we input different login ID and password to

test the program. If the component is coded to expect a positive input value, there may include a test case for each of the following:

i) A very large positive integer
ii) A positive integer
iii) A positive, fixed-point decimal
iv) A number greater than 0 but less than 1
v) Zero
vi) A negative number
vii) A nonnumeric character

With this, the reaction of the program to the input data could be tested. This could identify the program's faults, which probably happen in normal condition.

d) Other Users

After the two testing has been used, the beta version of the system is launched to other users for testing purpose. This is to identify the fault that may incur in any other unexpected condition. The testing involved with random situation. From the testing, the feedback is collected from the user. This feedback provides some important information about the usability and reliability of the application.

6.2.2 Module Testing

After the unit testing, the module testing which include the user module testing and the administrator module testing is performed. One administrator and some product's data have to be created in performing the testing. The testing was carried out to ensure that the codes under the module function accordingly when all units of code are integrated. If the error is exist in a particular module, then the relate part of the module that goes wrong can be identify and unit testing is used to identify the errors.

6.2.3 Integration Testing

When the individual modules are working correctly, and meet the objectives, these modules are integrated into a working system. In other words, integration testing is

the process of verifying that the system modules work together as described in the system and program design specifications. The system is viewed as a hierarchy of components, where each component belongs to a layer of the design. Top-down approach has been used for the Integration test. This approach is reapplied until all components are incorporated. Figure 6.4 shows how top-down testing works with the system.

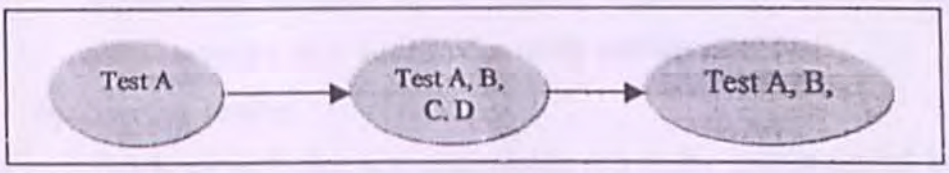


Figure 6.4: Top-down testing

During the integration, all the module prototypes were combined and tested in a testing environment. The testing environment was consistent for all the modules in terms of testing needs for each of the modules were reviewed and identified. Then, the program flow for the entire system were reviewed and tested. After that, the entire system was tested with some test cases. Finally, the system is published to let the other users to test it.

6.2.4 System Testing

The last testing procedures done is system testing. Testing the system is very different from unit and integration testing. The system testing is to ensure that the entire application, of which the modified program was a part, still works. It is used to test the integrated system and verify whether it meets the specified requirements.

Restaurant Ordering & Reservation System is tested whether it meets specific performance efficiency objectives in performance testing. Data integrity testing used to verify that the data is stored in a manner where it is not compromised under updating, restoration or retrieval processing in the system. Restaurant Ordering & Reservation System has undergone 2 types of system testing:

i) **Function Testing**

System testing begins with function testing. Whereas previous test concentrated on components and their interactions, the first step ignores system structures and focuses on functionality.

ii) Performance Testing

It is designed to test the run-time performance of the system within the control of and integrated system. It occurs through all the steps in the testing process.

a) Stress Testing

Stress Testing is to determine whether a program has fulfilled the requirements designed for it. Equally important is to make sure that program works, as it should, even under extreme condition.

b) Security Testing

This is to verify the protection mechanism or the system against improper penetration.

c) Timing Testing

Timing testing evaluates the requirements dealing with time to respond to a user and time to perform a function.

d) Human Factor Testing

This is to investigate requirements dealing with the user interface to the system. Display screens, messages, report formats, and other aspects that may relate to ease of use had been examined.

6.3 Summary

Software testing is a critical element of software quality assurance and represents the ultimate review of specification, design and coding. After doing this part, we can uncover logic error and make sure the system conform to the requirement specified.

At the end of the testing phase, the system should be able to perform the tasks required and free of some errors. The system should be ready to use by the user. However, there are still some critical problems and errors will occurred only after some time of using the system. Therefore, work of testing should not just end up in this phase but have to keep on every now and then to make sure the system is functioning well. This will last for a long period.

Chapter 7: System Evaluation

Chapter 7: System Evaluation

7.1 Introduction

Generally lots of technical and non – technical problems were encountered during the development stage. However, most of the problems were detected and resolved eventually but some are not. System evaluation is the process of identifying a system's strengths and limitation, thus, allowing iliustration of possible enhancement of a system.

This is important to allow precise changes to be made to the system. System evaluation highlights on the knowledge gained and the problems faced while developing the system and the steps taken to overcome them.

Besides, the system strengths and system constraints have been list out as detail as possible in this chapter. So that any weaknesses of the system can be improve in the future enhancements.

7.2 Problems Encountered and Solutions

The following are the major problems encountered from the beginning of the project through the end of the system development process.

a) Difficulties In Determining System Scope

Without experience in Palm OS application development and also IVR application development, it is difficult to define the scope of the system in the early stage. Due to the insufficient knowledge and time constraint, it is impossible to built a full – scale complete system within the given time frame.

To solve this problem, reference and analysis on current relevant systems has been conducted in order to understand the system design and try to adopt some of the ideas into the system design of the project.

b) Problems In Tools And Language Selection

Since developing a Palm OS application and IVR system is quite a new technology and non of the previous years students have using the technology

before, it is difficult in selecting the most appropriate tools and software for the development in the beginning stage. . It is because the process of choosing the suitable technology and tools for project development is a very critical process as different tools has its strengths and weaknesses.

Hence, to learn more information, in depth studies and research on the programming language and tools using were conducted in the earlier stage if the development. The studies and research activities including Internet surfing, reference books, review the current systems in the market and others.

c) Lack of Knowledge In the Language And Tools Chosen

Due to time constraint, the learning and developing process was done in parallel. The new programming languages and concepts were never taught before and to implement such an application requires a fair grasp the language. Without a strong base of the language and lack of knowledge in using the selected tools (Parity Software, AppForge 2.0) and the Palm OS architecture and IVR technology, it needs more time in looking for technical and non – technical solutions to solve problems that occurred during the system development.

Most of the problems faced were manageable through browse the Internet for related materials and referring to the reference books available in the market. A more efficient was through trial and error during the coding phase.

d) Difficulties In Designing User Interface

First of all, problem that faced during the early stage of development is lack of knowledge and experience of the real system flow and layout of standard user interface. Therefore, it is difficult in designing the most appropriate logic and user interface in the system. These make the process of development became slow.

To get more knowledge to the system flow and user interface design, some real commercial Palm OS and Visual Basic application were taken as reference. This will make the user interface more presentable and attractive.

e) Difficulties In Voice Recording

The IVR Reservation subsystem involves voice messages playing. It was hard to decide whether to use commercial text-to-speech software to generate the voice messages or records human voice instead.

Discussion with those who have experience in designing IVR application was held in order to solve this problem.

7.3 End User Evaluation

Due to the difficulties encountered in conducting the System, three restaurants in Klang valley were chose to evaluate the system. The following results, compliments and comments were elicited:

1. **Positive Comments**
   a) New technology and solution to improve and speed up restaurant services
   b) User friendly
   c) System flow smooth and logical
   d) User interface look standardized

2. **Negative Comments**
   a) Higher cost to set up the system
   b) Requires little time to learn to use and training has to be carried out
   c) System function should be integrated with currently used restaurant management system

7.4 System Strengths

a) User Friendliness

Restaurant Ordering & Reservation System is specially designed on the principle for ease to use. As such, Graphical User Interface (GUI) features have been integrated into the system. The inclusion of GUI has contributed vastly to aid users. Users can easily capture the overview of the system, without even referring

to the Help provided. The user interface is designed in consistent manner in order to ease the users' perception and shorten the learning curve especially to novice users. While for the wireless order taking subsystem, the main key in designing the interface does not focus on the graphical and interactive images because Palm OS device has limited memory and capacity in displaying image. However, it will focus on simplicity, ease of use and fast access and response time.

b) Effective System Control

Restaurant Ordering & Reservation System has employed effective identification authentication technology to protect the system from unauthorized access. For the backend monitoring subsystem, administrator is given privilege control to maintain and updating the database record.

For the wireless order taking subsystem, wait staff are allowed to access the application just after the wait staff login by using the correct ID. Each wait staff will have a unique LoginID, at which the restaurateur can easily keep track of which order is taken by which staff. Therefore, they system is so well designed.

c) Fast Response For Retrieving Information and Fast Data Synchronization

Generally, all the interfaces of the wireless order taking subsystem are designed to be light weighted. Therefore, system can be loaded within a reasonable time frame and fast response time in retrieving needed information. Besides that, system is designed such a way where the data synchronization between the Palm OS device and main database could happen within only a couple of seconds. This is very crucial in providing a real time communication between the table, kitchen and counter to fulfill one of the system development objectives as stated in the previous chapter.

d) Easy Reservation Facility

IVR Reservation subsystem is very easy to use. It is designed such a way that simplifies the user's reservation process by providing clear human recorded voice instruction. It takes only a few of steps in order to reserve a table. Therefore, it is

easy to learn up, use and understandable. The simplicity of system also enables the users to perform their task and handle it easily. As compare with other existing manual and online reservation systems, the system auto assign tables that could fulfill the total number of seats required by the each customer, where the restaurateur no need to spend time on processing each reservation and check which tables are available for reservation purpose.

e) Ease of Use

The cognitive walkthrough has shown that the system is very easy to use for several reasons. First, by having the food categories in intuitive groupings, the wait staff was predicted to efficiently navigate the menus to find what they were looking for. Also, since it well known that recognition is superior to recall, memory burden on the part of the wait staff was kept to a minimum. Also, the number of options available to the wait staff at any one time was kept low to reduce the burden of trying to decide which button or option is needed. While the screen size is typically small on palm-sized computers, the use of large buttons allowed the wait staff to clearly see and act on them with just their finger.

f) Speed of Service From The Waiter's Perspective

This is an important variable because the ultimate goal of the restaurant is to serve as many customers per unit time as possible. If customers are seated but waiting to be served because the wait staff is tending to other tables or correcting orders, it has the unintended effect of looking unprofessional. It is also important for the waiters to wait on more people because they can make more money in tips. If they spend the same time with each table, yet cut out other extraneous time walking in the restaurant, the wait staff will be happy and the customers will be more satisfied.

g) System Transparency

System transparency refers to the condition where the users do not need to know how is the system structure, where the database resides, its database management

system and anything related to the system implementation. For instance, users do not need to know how to retrieve and insert records into database and how to update their information. All they need to do is to submit data required and then view the results.

h) Highly Integrated Module

Most of the modules and sub modules in the system are highly integrated where data change and updates in any one module can be detected and copied to other related modules automatically. This will reduce data entry and also management time.

i) Reliable System With Effective Errors Handling

Input of the users is validated and verified to prevent errors caused by the invalid input. If there is an input failure occurred. An error message is generated and displayed to inform the user about the error. For example, there is an error message will be prompted for retry login when Administrator input the invalid login ID or/and password for the backend monitoring subsystem.

j) Dynamic Database Access Capability

For the data to be useful, it is organized and stored in the form of database. It is includes all the information displayed in the system such as menus data. Furthermore, data manipulation can be done easily and effectively.

k) Consistency

The screen design is consistent throughout the whole system. The menus are always displayed at the same position although the user switched from one module to another. Users can easily seek for a particular option that they require in the system.

7.5 System Limitation

There are some limitations in the Restaurant Ordering & Reservation System due to time constraints facilities, constraints and limitations of the programming language itself, and the project boundaries, including:

a) **Limitation Functionality**

Billing function and other restaurant management function is not included in the system. Additional works have to be done in order to integrate the system with the restaurant currently used system.

b) **Range Limitation For Data Synchronization**

Range limitation by using infrared wireless network technology. More access point has to be set up for large-scale restaurant.

c) **Absence of Report Generation Facilities**

No analysis and report generating facilities included.

d) **Small Screen Resolution on Palm OS Device**

While the screen size is typically small on palm-sized computers, the length of the menu item name that appears on the screen is limited. Restaurateurs who use the system has to make adjustment in order to give a short, logic and understandable menu item name.

e) **Specification of The Table Number**

This scope limitation makes the system suitable only for restaurant that prepare ordered items base on the specification of the table number.

7.6 Future Enhancement

The system will be maintained through the lifetime of the system because the user requirements will vary from times to times. Therefore, enhancement in the future will extend the usability of the Restaurant Ordering & Reservation System. Moreover, the

system limitations should be improved to enhance the functionality. There are several enhancements that could extend the usability of the developed system:

a) **Provide "Help Topic" to help the users learn up the system in a shorter period**

b) **Provide Cancellation Function In IVR Reservation Subsystem**

On the current IVR Reservation subsystem, there is no cancel function where the customer can call up and cancel the reservation they have made. Therefore, in the coming future, the system should add in this function in order to make the system more complete and usable.

c) **More Functionality Added**

Extend the functionality of the system that could processes the billing and generate the restaurant end of the day analysis and report.

7.7 Knowledge Gained

a) Have the opportunity to learn a new programming language, Visual Basic.

b) Learnt additional software tools and additional knowledge (Parity Software and AppForge 2.0)

c) Have the opportunity to learn Palm OS architecture and Interactive Voice Response (IVR) technology

d) Learnt techniques to plan and develop a system.

e) Learnt how to use Ms SQL 7.0 to build the database server.

f) Learnt to work independently.

g) Cultivated skills in writing documentations and reports

h) Enhanced time management skills

i) Developed skills in information and facts gathering

7.8 Summary

Restaurant Ordering & Reservation System is a system with strength and limitations of it own. The lure of greater efficiency, lowered costs and higher quality drive mast of organizations to gain competitive edge in business from the knowledge of Information Technology. Restaurant Ordering & Reservation System is a start to computerize the operations in the business organizations towards the effort of paperless concept.

Overall, the Restaurant Ordering & Reservation System has achieved and fulfilled the objectives and requirements as stated in the project proposal.

However, there are still many rooms for improvement in system. It is hope that this system will be a success and provide a foundation upon which more innovative and comprehensive system may be built to perform multiple tasks and fulfill various restaurateurs' requirements.

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Appendix A: Questionnaire

1. How long have you been involved in food service industry?
   - ☐ < 1 year
   - ☐ 1-3 years
   - ☐ 4-6 years
   - ☐ 7-9 years
   - ☐ >10 years

2. What kind of ordering method that your restaurant uses currently?
   - ☐ Through writing (pen and pad)
   - ☐ Memorize orders
   - ☐ Touch screen ordering
   - ☐ Others (Please specify) _____

3. Could you please explain the flow of the ordering between table, kitchen and counter/fixed POS terminal?

4. In general, how satisfied or dissatisfied are you with the existing ordering method that has been using in your restaurant currently?
   - ☐ Completely satisfied
   - ☐ Mostly satisfied
   - ☐ Neither satisfied nor dissatisfied
   - ☐ Mostly dissatisfied
   - ☐ Completely dissatisfied

5. If you are not completely satisfied with the currently ordering method, what are some of the followings could describe your present problems?
   - ☐ Order was written down or read incorrectly
   - ☐ Duplication orders between the tables and fixed POS terminal
   - ☐ Time consuming as was the need to move from table, kitchen and fixed POS terminal
   - ☐ Wait staff has no time to interact with the customers
   - ☐ Other (Please specify) _____

6. Do you think you need a better solution to improve the ordering progress?
   - ☐ Yes
   - ☐ No

7. Have you ever heard about wireless handheld ordering system?
   - ☐ Yes
   - ☐ No

8. Do you think wireless handheld ordering system would be a suitable technology for your restaurant?
   - ☐ Yes
   - ☐ No

9. What kind of reservation method that your restaurant uses currently?
   - ☐ Walk in reservation
   - ☐ Call in reservation
   - ☐ Online reservation

   Others (Please specify) _____

10. What are the problems with the selected method in question 9?

Appendix B: User Manual

1.1 Introduction

Restaurant Ordering & Reservation System is divided into three parts, which are Wireless Handheld Order Taking subsystem, IVR (Interactive Voice Response) Reservation subsystem and Backend Monitoring subsystem.

Wireless Handheld Order Taking subsystem is a direct replacement for the pad and pencil that waiters carry around today, and is targeted for small or medium-size, busy, sit-down restaurants. Every wait staff will be given a Palm OS equipped handheld to take order by using stylus pencil, and signal from every handheld will be received by a computer system via infrared, where the order is then send to the kitchen, bar and counter within a local area network. The order list will be displayed on a screen in the kitchen to notify the kitchen staff. This system provide restaurants staff with a revolutionary new way to exchange information, which increases efficiency and profitability. Waits staff able to add, cancel or delete an order.

IVR (Interactive Voice Response) Reservation subsystem works in such a way similar with any others IVR applications in the market such as help desk IVR system. Callers can use their touch-tone pad to input requests, in this case are reserving a table. Database then speaks information back to the caller. Customers will be asked to key in their contact number and a reference number will be given to them for successful reservation. Customers could conduct transactions 24 hours a day, seven days a week.

Backend Monitoring subsystem will be the part that monitor and control the other two subsystem of the Restaurant Ordering And Reservation System. This is where the main server resides that stores the needed data. Restaurateur or any authorized person could login to the system and perform some tasks such as checking the currently order status for each table and reservation record. All meals that coming out from the kitchen will be checked and recorded down by the staff at the counter side into the system, which will then be sent to the customer by a runner.

1.2 Run Time Requirements

The software requirement needed to run Restaurant Ordering & Reservation System include:

a) Microsoft Window 95, 98, NT, or 2000 operating system
b) Microsoft SQL Server 7.0
c) Palm OS 4.0

The hardware run time environment for Restaurant Ordering & Reservation System include:

a) Pentium II 233 MHZ and above or AMD K6-2 300 MHZ and above
b) Memory 32 MB RAM
c) Minimum 4.0 GB Hard Disk
d) Network connection through existing hardware configuration.
e) Keyboard and Mouse as input devices
f) IVR card
g) 4-Port Voice Processing Boards
h) Palm OS device
i) Infrared signal receiver

1.3 Wireless Order Taking Subsystem

Figure 1.1 Splash Screen

Figure 1.1 above is the splash screen that loaded when the application is launched.

1.3.1 Login

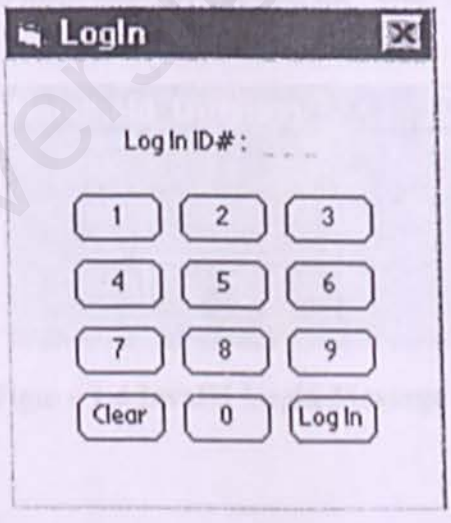

Figure 1.2 Login

Figure 1.2 is a Login screen to allow the authorized user to login. User can login to the system by tapping in their personal valid login and follow by clicking the "Log In"

button. If user makes any mistakes in inputting the login ID, they can click on the "Clear" button to clear the currently inserted ID and reenter again. There are two situations where the user cannot be redirected to the main menu:

i) User click on the "Log In" button without complete the login ID field. . An error message will prompt out in the Login page to inform user to try again as illustrated in Figure 1.3. User will be redirected back to Login page to login again by clicking the "OK" button.

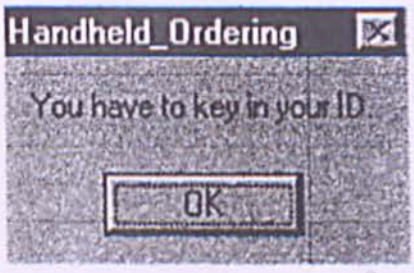

Figure 1.3 Invalid Login Message Box

ii) User input an invalid Login ID. An error message will prompt out in the Login page to inform user to try again as illustrated in Figure 1.4. User will be redirected back to Login page to login again by clicking the "OK" button.

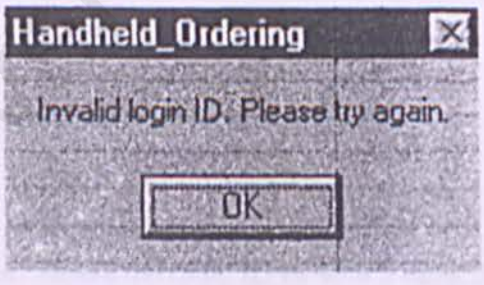

Figure 1.4 Invalid Login Message Box

1.3.2 Service Options

Figure 1.5 Service Options

Successful login will redirect the user to the Service Options page that consists of three options as depicted in Figure 1.5.

1) Tap on "Create New Order" button to create a new table. User will then be redirected to Service Table screen as shown in Figure 1.6.
2) Tap on "View Order" button if the user wishes to view the existing order. User will then be redirected to Service Table screen as shown in Figure 1.6.
3) Tap on "Logout" button if the user wishes to log out from the system.

1.3.3 Service Table

This is the screen where user enters the table ID of which table they would like to create a new order or view the order of.

1) Enter the table ID
2) Tap on "OK" button
3) Valid table ID will bring the user to Order Items screen as depicted in Figure 1.7 if the user chose Create New Order option in Service Options screen or View Order screen as depicted in Figure 1.8 if the user chose View Order option in Service Options screen at the beginning.

4) Tap on "Clear" button to clear incorrect table ID
5) Tap ob "Back" button redirect the user to Service Options screen (Figure 1.5)

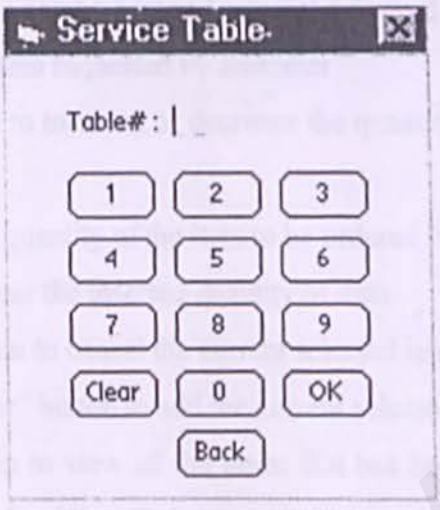

Figure 1.6 Service Table

1.3.4 Order Items

Figure 1.7 Order Items

Order Items screen as shown in Figure 1.7 is where the user can select the item to be ordered. There is a combo box that contains the main courses at the top right of the screen. Items belong to each course will be shown when the course is selected.

1) Tap on the main course combo box and select the desired course
2) Select and tap on the item requested by customer
3) Tap "+" or "-" button to increase or decrease the quantity of each item ordered by customer
4) Tap on the number as quantity of the item to be ordered by customer.
5) Click "<" button to clear the inserted quantity of item
6) Tap on "Cancel" button to cancel the current selected item
7) Tap on "Add To Order" button to add the current selected item to the order list
8) Tap on "View" button to view all the items that has been added to the order list. User will be redirected to View Order screen as shown in Figure 1.8.

1.3.5 View Order

Figure 1.8 View Order

This screen let the user view the items been ordered by customer for a specific table.

1) Tap on "Add Item" button to go back to Order Items screen.

2) Tap on "OK" button to exit the View Order screen and return to Service Options screen.
3) Tap on each row of item will bring out an Edit Item screen as shown in Figure 1.9

1.3.6 Edit Item

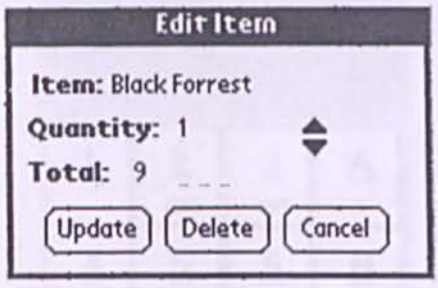

Figure 1.9 Edit Item

User can make changes to the selected item.

1) Tap on up or down arrow to increase or decrease the quantity of the currently selected item
2) Tap on "Update" button to update the changes that has been made
3) Tap on "Delete" button to delete the currently selected item
4) Tap on "Cancel" button to exit the Edit Item screen and return to View Order screen

1.4 IVR Reservation Subsystem

Figure 1.10 is a SimPhone used to explain the tasks need to be performed to make a reservation.

Figure 1.10 SimPhone

1) Enter the telephone number
2) System will play a welcome message and specify the conditions need to be followed in order to make a reservation
3) System prompts a voice massage "Enter the month for your reservation", requests the user to enter the month. Press 1 for January, press 2 for February and so on
4) Enter the month
5) Valid input will prompt out "Enter the day for your reservation" voice message or else user will be requested to reenter the month of the reservation
6) Press 1 for first day of the month, press 2 for second day of the month and so on
7) Valid input and accepted reservation date prompt the user to select the time section for reservation. "Press 1for morning section (11 am), press 2 for afternoon section (12-10 pm)

8) Valid input will follow by requesting the user to enter the time for the reservation
9) If all the tables in the restaurant are not fully booked at the requested time, user will then be asked to enter the number of seats to be reserved.
10) Enter the number of seats
11) If total requested seats are available, system will prompt the user a voice message to enter the contact number
12) System will then plays a message that consists of the reservation details that has been entered by the user
13) User will then be asked to press 1 to confirm their reservation
14) System plays confirmation and thank you message

1.5 Backend Monitoring

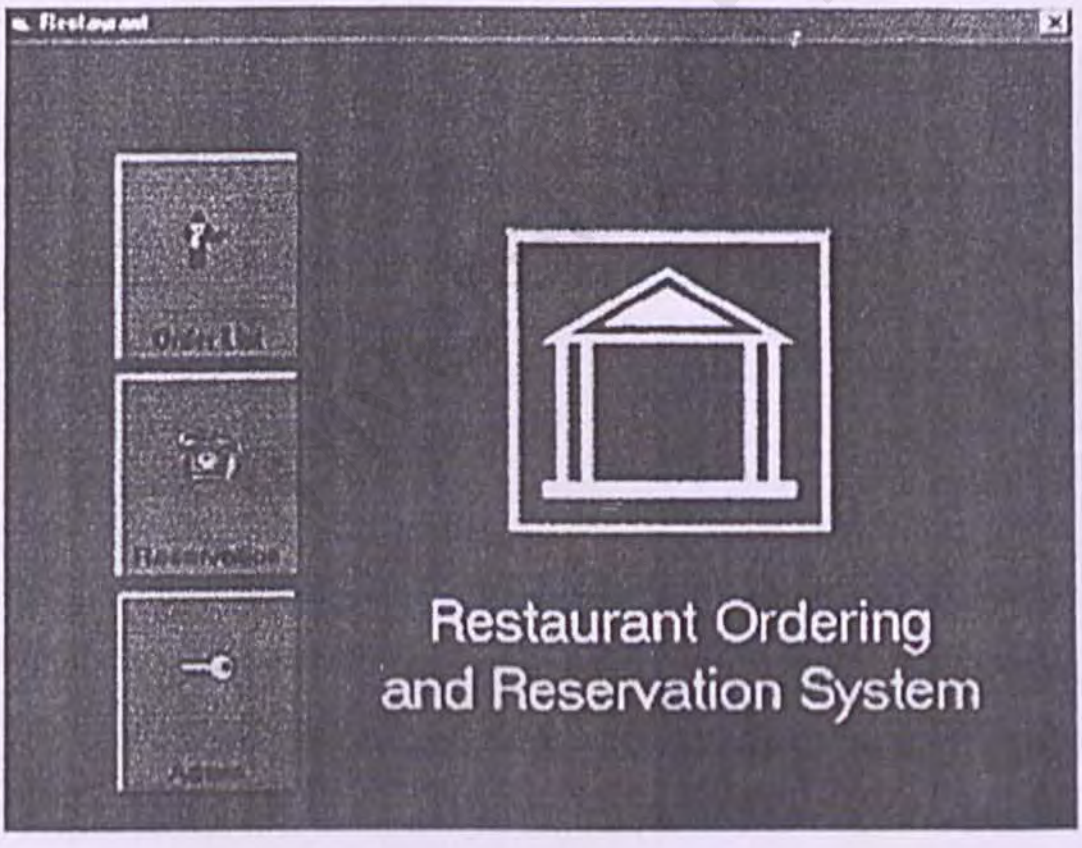

Figure 1.11 Main Screen

Figure 1.11 is the main screen of the backend monitoring subsystem. This main screen consists of three major buttons that reflects the major functions of the backend monitoring subsystem. Order List function lets the user to view currently unpaid table order,

1) Click on "Order List" button will direct the user to Order List page as shown in Figure 1.12
2) Click on "Reservation" button will direct the user to Reservation page as shown in Figure 1.14
3) Click on "Admin" button will direct the user to Login page as shown in Figure 1.15

1.5.1 Order List

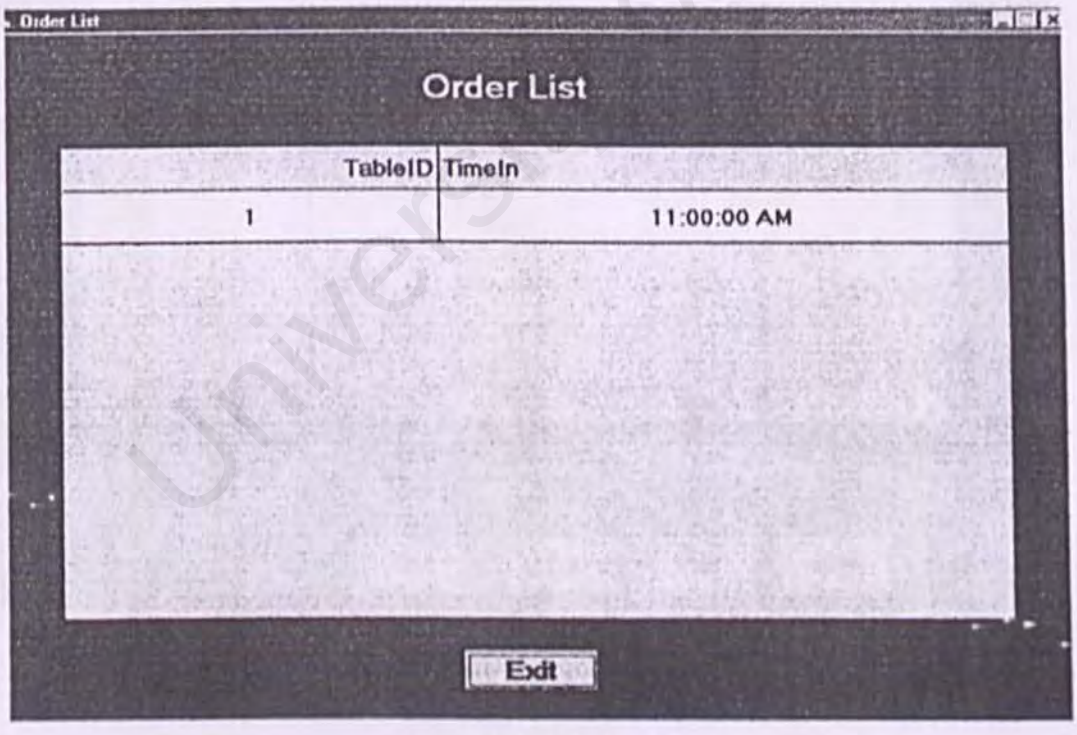

Figure 1.12 Order List

Order List is the page where user can view all the currently unpaid table order.

1) User can select a table to view its ordered items by clicking on the row that represents the table on the gray box. An Ordered Items page as shown in Figure 1.13 will be displayed.
2) Click "Exit" button to return to the Main page (Figure 1.11)

1.5.2 Ordered Items

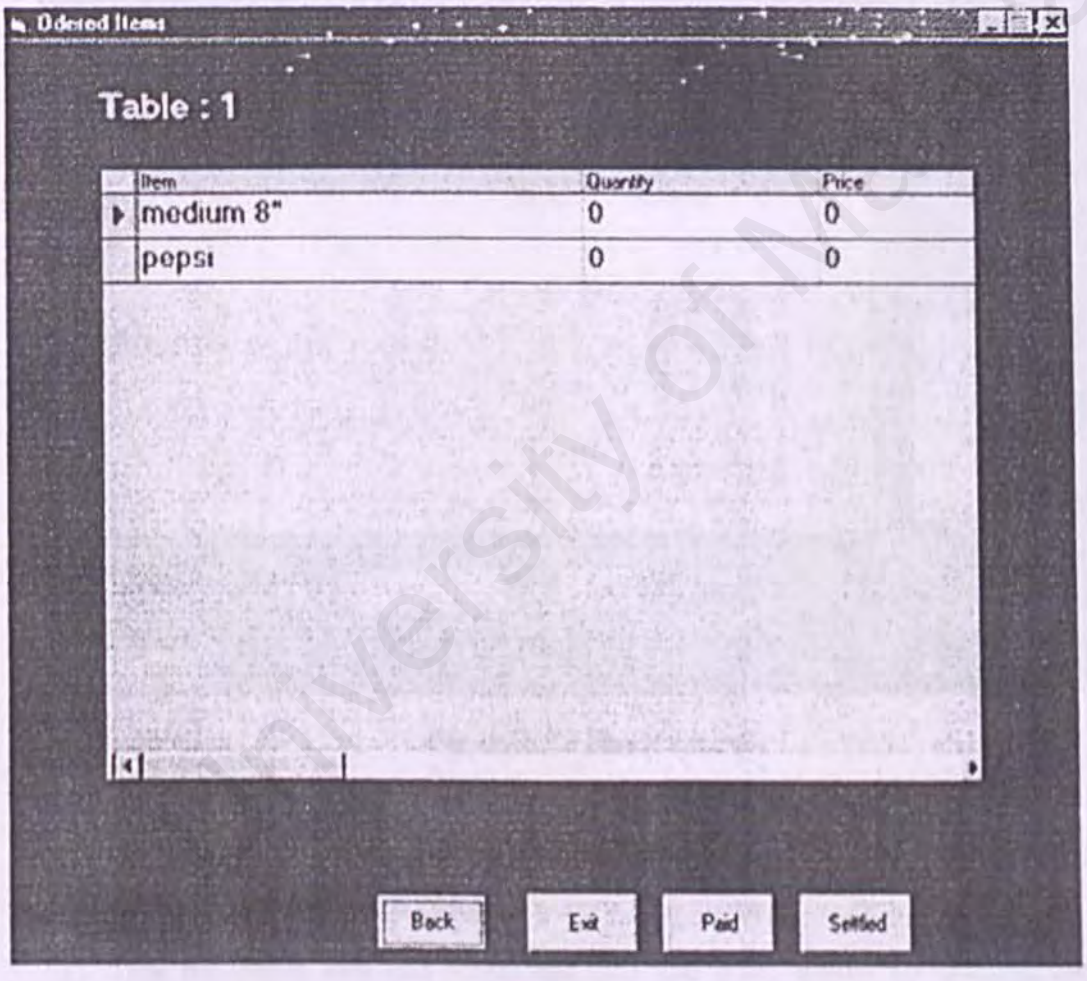

Figure 1.13 Ordered Items

This is the page where user could see the price, status, and quantity of each ordered item.

1) Select the row that represent each specific item and click "Settled" button to set the status of the item to true

2) Click "Back' button to return to the previous screen (Figure 1.12)
3) Click "Exit" button to exit this page and return to Main screen (Figure 1.11)
4) Click "Paid" button if the bill has been settled

1.5.3 Reservation

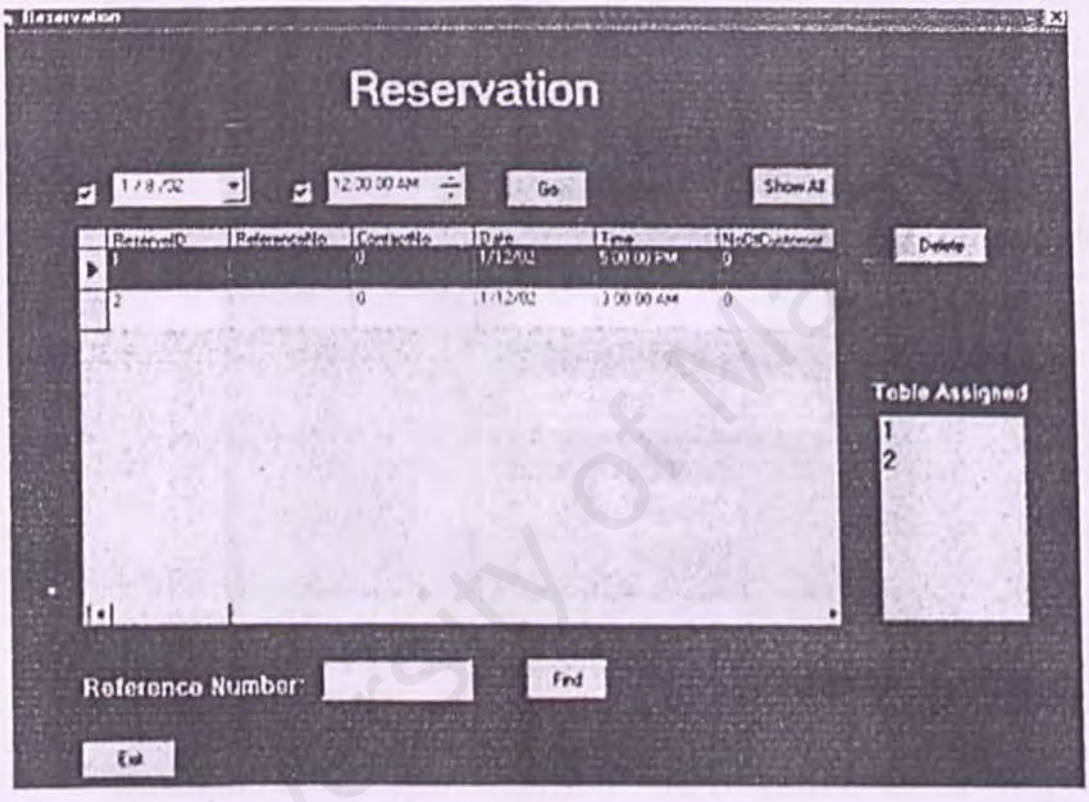

Figure 1.14 Reservation

This is the page where user manages the reservation details. The table in the middle shows the details of each reservation.

1) Tick the check box and select the date and time, follow by clicking the "Go" button to view the selected reservation records
2) Enter the reference number at the bottom to locate the specific reservation record
3) Click "Show All" button to locate all existing reservation records
4) Select the row that represent each specific reservation detail and click "Delete" button to delete the current selected record

5) Click "Exit" button to return to the Main screen (Figure 1.11)

1.5.4 Admin

This is the administrator section where user can perform maintenance or editing tasks on restaurant table list, wait staff record and menu list. In order to use this function, users have to enter the valid login ID and password on the Login page as depicted in Figure 1.15.

Figure 1.15 Administrator Login

1) Enter the login ID
2) Enter the password
3) Click "Login" button
4) Click "Cancel" button to exit the screen and return to the Main screen (Figure 1.11)

Invalid login ID and password will prompt out an error message as shown below.

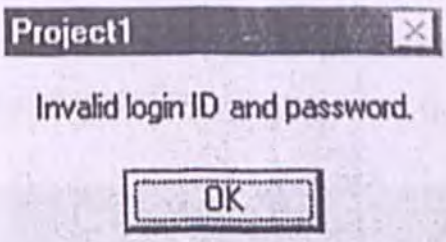

Figure 1.16 Invalid login ID and password

Successful login will display the administrator main menu as shown in Figure 1.17

1.5.5 Administrator Login

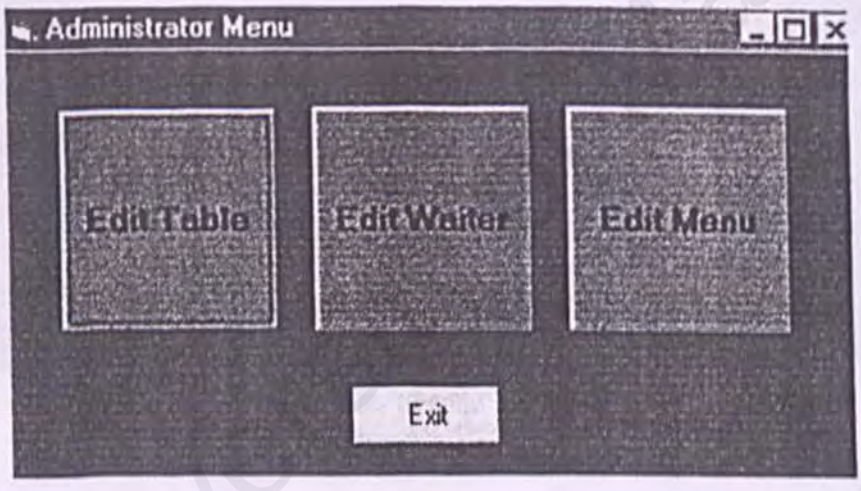

Figure 1.17 Administrator Menu

There are three buttons that represent the tasks that the user can perform.

1) Click "Edit Table" button will redirect the user to Table screen as shown in Figure 1.18
2) Click "Edit Waiter" button will redirect the user to Waiter screen as shown in Figure 1.19
3) Click "Edit Menu" button will redirect the user to Menu Maintenance screen as shown in Figure 1.20
4) Click "Exit" button to exit and return to the Main screen (Figure 1.11)

1.5.6 Table

This is the page where user can add new table, edit and delete the table ID and number of seats of the exiting table in the restaurant.

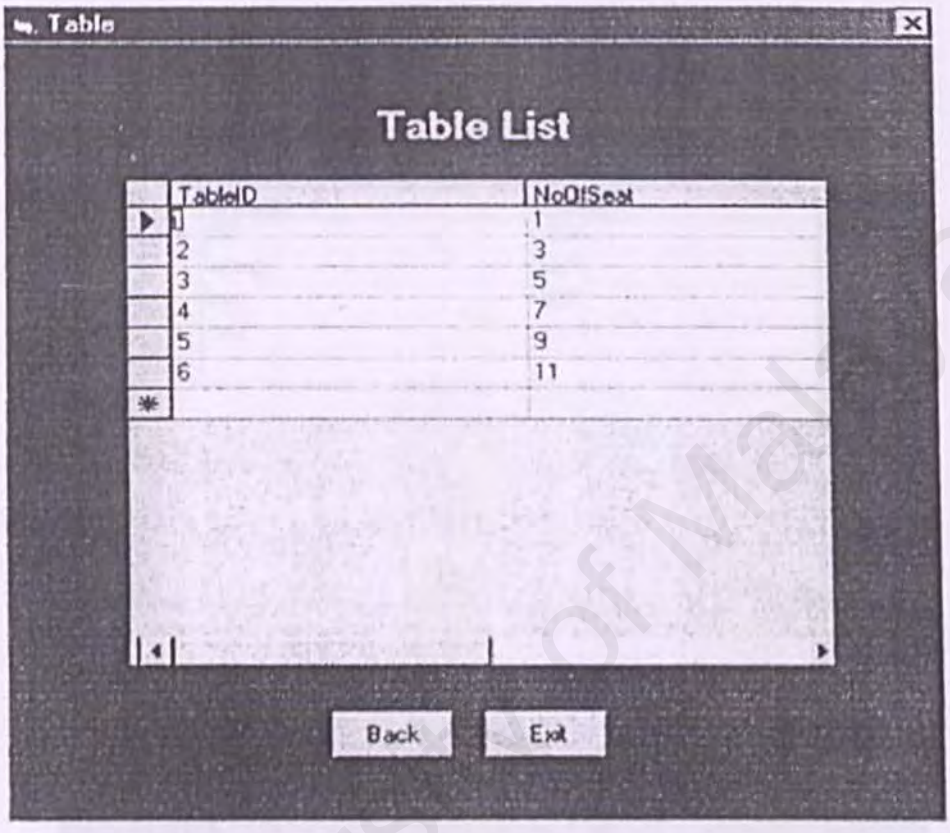

Figure 1.18 Table

1) Select the data
2) Delete data by pressing "Delete" button on the keyboard
3) Edit the data
4) Add table by selecting the last row of data and pressing the key down button on the keyboard
5) Click "Back" button to go to the previous screen (Figure 1.17)
6) Click "Exit" button to return to the Main screen (Figure 1.11)

1.5.7 Waiter

This is the page where user can add new wait staff, edit and delete the wait staff ID and login ID of the exiting wait staff in the restaurant.

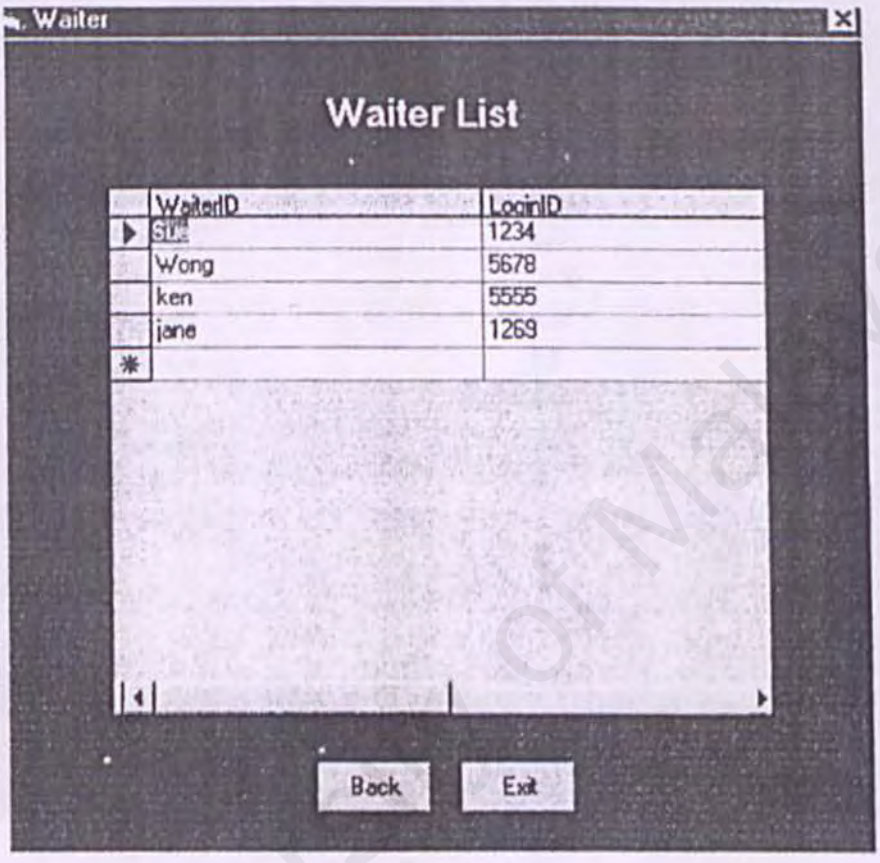

Figure 1.19 Waiter

1) Select the data
2) Delete data by pressing "Delete" button on the keyboard
3) Edit the data
4) Add new wait staff by selecting the last row of data and pressing the key down button on the keyboard
5) Click "Back" button to go to the previous screen (Figure 1.17)
6) Click "Exit" button to return to the Main screen (Figure 1.11)

1.5.8 Menu Maintenance

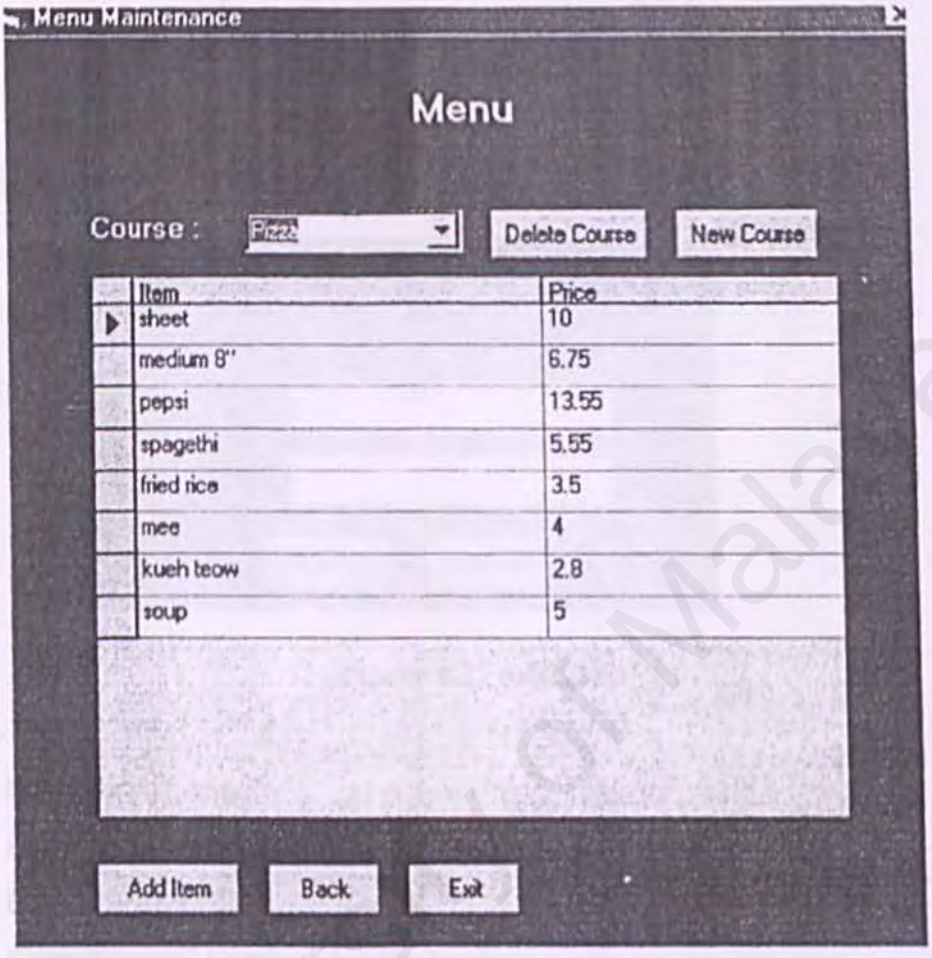

Figure 1.20 Menu Maintenance

User can add item under selected course, delete course and add new course at this section.

1) Select the course and items belong to that particular course will be displayed in the table
2) Click "Add Item" button to add a new item belonging to the currently selected course. . Add Item screen will be shown as illustrated in Figure 1.21
3) Click "Delete Course" button to delete the selected course and all its items
4) Click "New Course" button to add a new course. User will be redirected to New Course page as shown in Figure 1.22

5) Click "Back" button go to the previous page (Figure 1.17)
6) Click "Exit" button to return to the Main screen (Figure 1.11)

1.5.9 Add Item

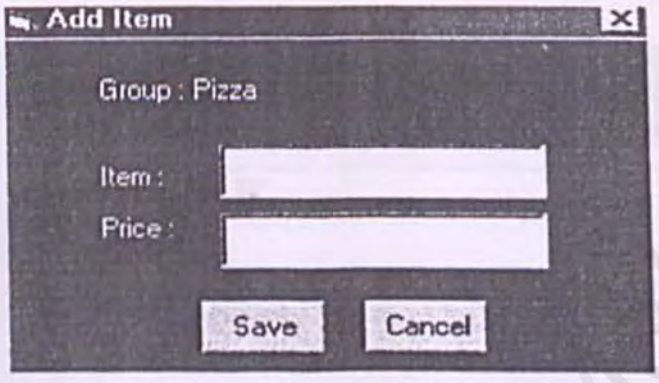

Figure 1.21 Add Item

1) Enter the item name
2) Enter the item price
3) Click "Save" button
4) Click "Cancel" button to exit the page

1.5.10 New Course

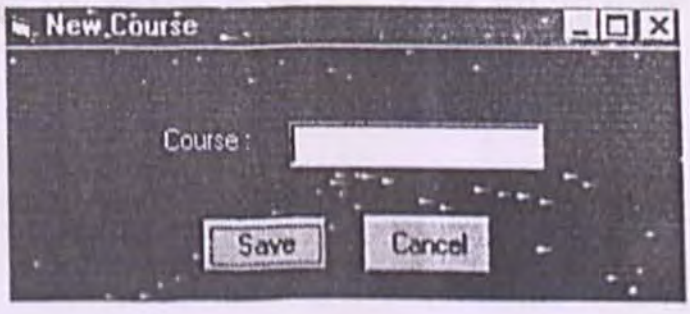

Figure 1.22 New Course

1) Enter the course name
2) Click "Save" button
3) Click "Cancel" button to exit the page

1.5.11 Display Order

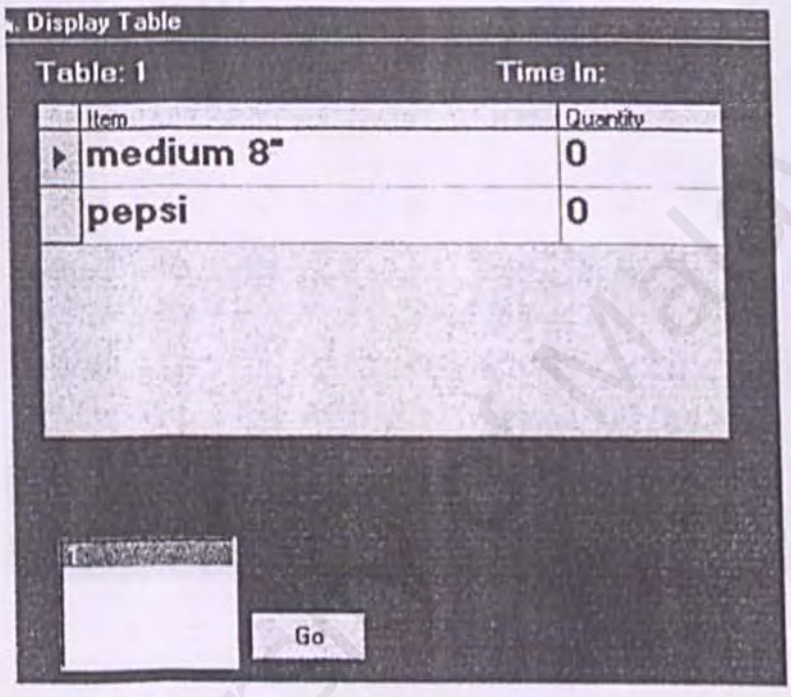

Figure 1.23 Display Table Order

This screen is displayed in the kitchen, which shows the unsettled items for each table. Select the table ID and clicking on the "Go" button will direct user to the screen that shows the items for that particular table as shown in Figure 1.24.

1.5.12 Order List

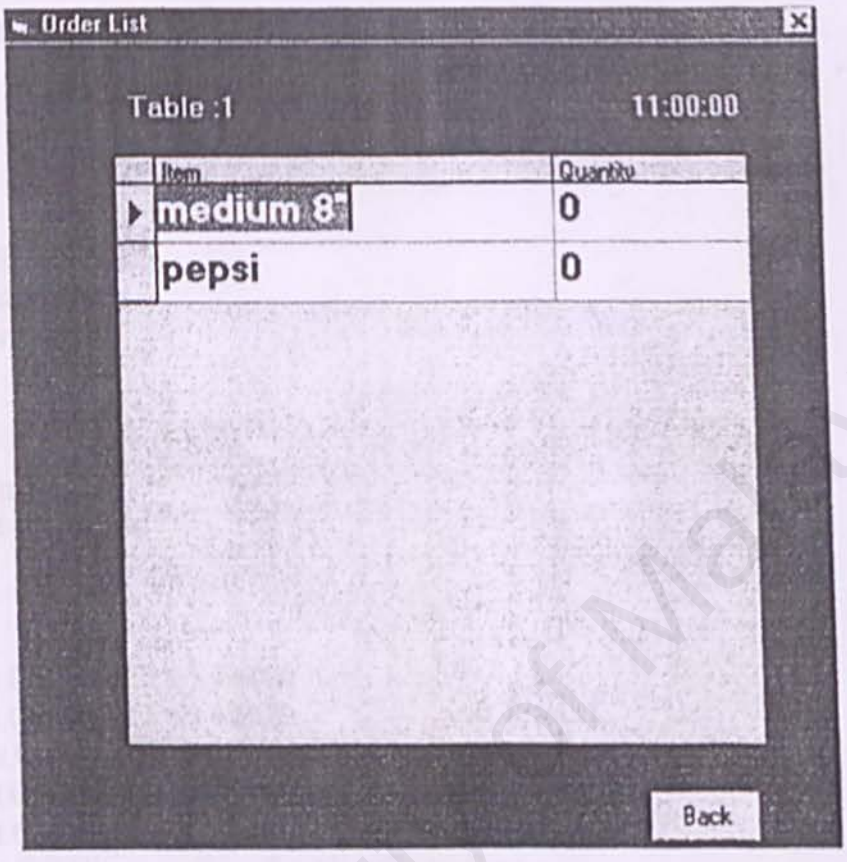

Figure 1.24 Order List

Click "Back" Button to return to the previous page (Figure 1.23)

Appendix C: Sample Codes

```
Private Sub cmdHome_Click()

frmMain.Show

End Sub

Private Sub cmdExit_Click()
   Unload frmTableList
   frmMain.Show

End Sub

Private Sub Form_Load()
   Dim intCount As Integer

   intCount = 1

   grdTableList.ColWidth(0, 0) = 4000
   grdTableList.ColWidth(1, 0) = 6020
   'grdTableList.ColWidth(2, 0) = 2000
   grdTableList.ColAlignment(0) = flexAlignCenterCenter
   grdTableList.ColAlignment(1) = flexAlignCenterCenter
   'grdTableList.ColAlignment(2) = flexAlignCenterCenter

   'adoOrderList.Recordset.MoveFirst


   While Not adoOrderList.Recordset.EOF
      grdTableList.RowHeight(intCount) = 600
      intCount = intCount + 1
      adoOrderList.Recordset.MoveNext
   Wend


   grdTableList.RowHeight(0) = 500


End Sub

Private Sub Form_Unload(Cancel As Integer)
Unload Me
Me.Hide
frmMain.Show
```

```
End Sub

Private Sub MSHFlexGrid1_Click()

End Sub

Private Sub grdTableList_Click()

   'If adoOrderList.Recordset.EOF Then

   intSelectedTable = grdTableList.TextMatrix(grdTableList.Row, 0)

   frmOrderList.adoOrderedItems.RecordSource = "SELECT * FROM Item,
OrderedItems WHERE Item.ItemID=OrderedItems.ItemID AND TableID = " &
intSelectedTable
   frmOrderList.adoOrderedItems.Refresh
   frmOrderList.lblTable.Caption = "Table : " + CStr(intSelectedTable)
   Me.Hide
   frmOrderList.Show
   'End If

End Sub


Private Sub Timer1_Timer()

End Sub

Private Sub Timer2_Timer()
   Dim rstOrderList As New ADODB.Recordset
   Dim rstOrderPaid As New ADODB.Recordset

   Dim qOrderedItems As String
   Dim qTrueItems As String
   Dim qUpdateOrderList As String
   Dim qOrderPaid As String

   'qOrderedItems = "SELECT COUNT(*) AS TotalRecord FROM OrderedItems
WHERE TableID=" & intSelectedTable
   'qTrueItems = "SELECT COUNT(*) AS SettledRecord FROM OrderedItems WHERE
TableID=" & intSelectedTable & " AND Settled=True"
   'qOrderPaid = "SELECT "

   qOrderPaid = "SELECT * FROM OrderList WHERE Paid=True"
   rstOrderPaid.Open qOrderPaid, gcnnStr
```

```
rstOrderList.Open "OrderList", gcnnStr

'If rstOrderedItems("TotalRecord") = rstTrueItems("SettledRecord") Then
    'qUpdateOrderList = "UPDATE OrderList SET [Settled] = True WHERE
'ableID=" & intSelectedTable
    'rstUpdateOrderList.Open qUpdateOrderList, gcnnStr
'End If

If Not rstOrderList.EOF Then
    While Not rstOrderList.EOF
        Dim rstOrderedItems As New ADODB.Recordset
        Dim rstTrueItems As New ADODB.Recordset
        Dim rstUpdateOrderList As New ADODB.Recordset

        qOrderedItems = "SELECT COUNT(*) AS TotalRecord FROM OrderedItems
WHERE TableID=" & rstOrderList("TableID")
        qTrueItems = "SELECT COUNT(*) AS SettledRecord FROM OrderedItems
WHERE TableID=" & rstOrderList("TableID") & " AND Settled=True"


        rstOrderedItems.Open qOrderedItems, gcnnStr
        rstTrueItems.Open qTrueItems, gcnnStr

        If rstOrderedItems("TotalRecord") = rstTrueItems("SettledRecord") Then
            qUpdateOrderList = "UPDATE OrderList SET [Settled] = True WHERE
TableID=" & rstOrderList("TableID")
            rstUpdateOrderList.Open qUpdateOrderList, gcnnStr
        End If

        Set rstOrderedItems = Nothing
        Set rstTrueItems = Nothing
        Set rstUpdateOrderList = Nothing

        rstOrderList.MoveNext
    Wend
End If

If Not rstOrderPaid.EOF Then
    Dim rstDeleteOrder As New ADODB.Recordset
    Dim rstInsertOrder As New ADODB.Recordset
    Dim rstDeleteItem As New ADODB.Recordset
    Dim rstInsertItem As New ADODB.Recordset
    Dim qDeleteOrder As String
    Dim qInsertOrder As String
    Dim qDeleteItem As String
    Dim qInsertItem As String
```

```
    qInsertOrder = "INSERT INTO OrderList_Back SELECT * FROM OrderList
HERE Paid=True"
    qDeleteOrder = "DELETE FROM OrderList WHERE Paid=True"

    rstInsertOrder.Open qInsertOrder, gcnnStr

    rstDeleteOrder.Open qDeleteOrder, gcnnStr


    While Not rstOrderPaid.EOF
        qInsertItem = "INSERT INTO OrderedItems_Back SELECT * FROM
)rderedItems WHERE TableID=" & rstOrderPaid("TableID")
        qDeleteItem = "DELETE FROM OrderedItems WHERE TableID=" &
stOrderPaid("TableID")

        rstInsertItem.Open qInsertItem, gcnnStr
        rstDeleteItem.Open qDeleteItem, gcnnStr
        rstOrderPaid.MoveNext

    Wend
End If

adoOrderList.Refresh

Dim intCount As Integer

intCount = 1

grdTableList.ColWidth(0, 0) = 4000
grdTableList.ColWidth(1, 0) = 6020

'grdTableList.ColWidth(2, 0) = 2000
grdTableList.ColAlignment(0) = flexAlignCenterCenter
grdTableList.ColAlignment(1) = flexAlignCenterCenter
'grdTableList.ColAlignment(2) = flexAlignCenterCenter


While Not adoOrderList.Recordset.EOF
    grdTableList.RowHeight(intCount) = 600
    intCount = intCount + 1
    adoOrderList.Recordset.MoveNext
Wend

End Sub
```

```
Option Explicit

Private mMainApp As MainApp          ' the application
Private mlTrunk As Long              ' trunk number
Private mbInCall As Boolean          ' a call is in progress
Private mbShuttingDown As Boolean    ' program is shutting down
Private mbShutdown As Boolean        ' program is shut down
Diin WithEvents mVoiceBocx As VoiceBocx ' VoiceBocx control
Dim WithEvents mNetHub As NetHubP    ' NetHub Plus control
Private mbInitialized As Boolean     ' VoiceBocx has been initialized

' set up the defaults
Private Sub Class_Initialize()
   mlTrunk = -1
   mbInCall = False
   mbShuttingDown = False
   mbShutdown = False
   mbInitialized = False
End Sub

' called when an AnsweringMachine object is being destroyed
Private Sub Class_Terminate()
   On Error Resume Next
   Dim state As DEV_STATE

   ' destroy the VoiceBocx control
   If mbInitialized Then
      ' if we are connected, disconnect
      state = mVoiceBocx.TrunkState
      If 0 <> Err.Number Then
         Call LogError
         state = DEV_STATE_Undefined
      End If
      If DEV_STATE_Connected = state Then
         mVoiceBocx.DisconnectCall
         If 0 <> Err.Number Then Call LogError
      End If

      ' unbind the trunk
      mVoiceBocx.TrunkChannel = -1
      If 0 <> Err.Number Then Call LogError

      ' Dereference the VoiceBocx object (hence destroying it)
      Set mVoiceBocx = Nothing

      ' notifiy to MainApp
```

```
    Call mMainApp.ThreadExited
  End If
End Sub

' MainApp uses this property during graceful shutdown
Public Property Get IsShutdown() As Boolean
  IsShutdown = mbShutdown
End Property

' must be called by MainApp to do setup
Public Function Initialize(ByRef MainApp As MainApp, ByVal lTrunk As Long) As
Boolean
  On Error GoTo Failed

  Set mMainApp = MainApp
  mlTrunk = lTrunk

  ' create the VoiceBocx control
  Set mVoiceBocx = New VoiceBocx

  ' disable error popups and log to window instead
'   mVoiceBocx.ErrorPopup = False

  ' set trunk
  mVoiceBocx.TrunkChannel = mlTrunk

  ' initialize NetHub
  Call NetHub_Initialize

  ' notifiy the MainApp
  Call mMainApp.ThreadRunning(mlTrunk)
  mbInitialized = True
  Initialize = True
  Exit Function

Failed:
  Call LogError
  Set mVoiceBocx = Nothing
  ' notifiy to MainApp
  Call mMainApp.ThreadExited
  mbShutdown = True
  Initialize = False
End Function
```